VOLUME 32 NUMBER 10 OCTOBER, 1949

AMERICAN JOURNAL
OF
OPHTHALMOLOGY

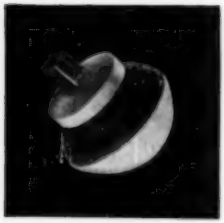
THIRD SERIES FOUNDED BY EDWARD JACKSON

CONTENTS

DEPARTMENTS

For complete table of contents see advertising page ix.

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars. Published monthly by the Ophthalmic Publishing Company. Subscription and Advertising Office: 664 North Michigan Avenue, Chicago 11, Illinois. Entered as second class matter at the post office at Menasha, Wisconsin.



CUTLER UNIVERSAL IMPLANT

The Cutler Universal Implant is an integrated motility implant for use in enucleation, eviscero-enucleation and secondary implantation.

8 Davis & Geck 000 Double-Armed catgut sutures with atraumatic needles supplied with implant if desired.

Experienced technicians are employed in all of our branch laboratories for the fitting and manufacture of the plastic prostheses which is used in conjunction with the implant.

- *THE FINEST IN ALL-PLASTIC ARTIFICIAL EYES*
- *ALL TYPES MOTILITY IMPLANTS*
- *SPHERE IMPLANTS (glass—plastic—gold)*
- *X-RAY THERAPY SHIELDS*
- *CONFORMERS, DRAINS, X-RAY LOCATORS*

CHICAGO
DETROIT
CLEVELAND
KANSAS CITY
MINNEAPOLIS
NEW ORLEANS
ST. LOUIS

Paul Gougelman Company

30 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS

NEW YORK
BALTIMORE
BOSTON
BUFFALO
PHILADELPHIA
PITTSBURGH
WASHINGTON

Shuron®

WIDESITE

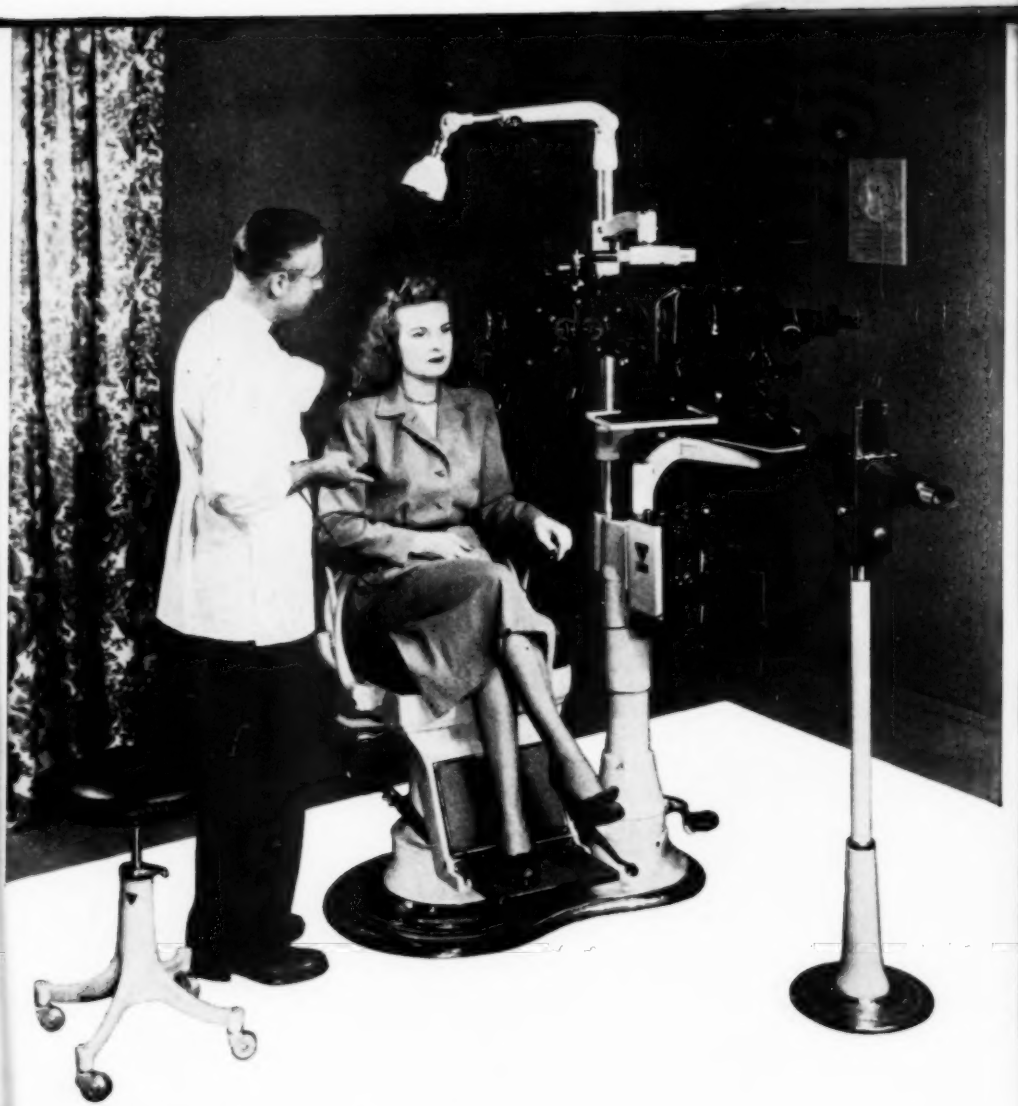
Lenses

Wide Angle lenses of the Highest Quality.

Designed to Reflect Your Professional Prestige.

Coast-to-coast service from Independent Suppliers.

SHURON OPTICAL CO., GENEVA, N.Y.



Your Skill Goes Further

NO degree of instrumentation can ever substitute for professional skill and judgment. But there can be no doubt that adequate instrumentation makes possible more efficient use of that skill. The Bausch & Lomb Hydraulic Chair and Unit makes possible a centralized refractive procedure. You gain the advantages of uniformly and critically precise refractive measurements, relaxation and co-operation of patients, and reduction of fatigue for yourself. You'll get more done with less effort, and you'll gain the satisfaction that all of your work measures up to a higher standard of excellence.

BAUSCH & LOMB

OPTICAL COMPANY ROCHESTER 2, N. Y.

here's what you have been waiting on

WOTTRING ELECTRIC LIFT TABLE AGAIN AVAILABLE

- ★ "Knee-action" control is an innovation—slight knee pressure on lever starts motor, raising or lowering the table, and freeing the hands for instrument operation. Maximum height, 35 inches, minimum 25 inches.
- ★ Designed so that the patient can be comfortably seated close to the instrument without leaning forward. Ideal for youngsters or women.
- ★ plenty of room on the handsome, chrome-trimmed table top for both Troposcope and Tropo-Flash, slide boxes or other instrumentation. Top is 18 inches by 22 inches.
- ★ perfectly balanced—plenty of speed at the base, a large tubular column for sturdiness, yet the overall design is very pleasing and professional looking.
- ★ two instrument receptacles are conveniently located in the base. AC motor is standard equipment as well as the black porcelain finish but DC motor and other colors are available on factory order at slightly higher cost.

IF you were at the Academy meeting in Chicago you'll remember the enthusiastic approval this beautifully designed table received. Many orders were booked and a number of tables delivered but full production was delayed until motors could be secured which would conform to the high standards of Wottring equipment. New, more powerful, smooth, quiet motors are now incorporated in these electric lift tables which will please you in every way. There's power to spare in quietly lifting and lowering the heaviest orthoptic or ophthalmic instrument with velvet smoothness. We have now started on a large backlog of orders for this electric lift table and, if you have not already placed your order, just use the convenient reservation form below. The introductory price of $180.00 with AC motor will be in effect on this first production lot.

45B TROPOSCOPE—TROPO-FLASH—ROYAL, DELUXE ROTOSCOPES—DEVIOMETER

RESERVE . . . ELECTRIC LIFT TABLES

FOR .....

ADDRESS .....

.....

THE *Wottring*
INSTRUMENT COMPANY
HUNTINGTON BANK BUILDING
COLUMBUS 15, OHIO

AMERICAN JOURNAL OF OPHTHALMOLOGY

SERIES 3 · VOLUME 32 · NUMBER 10 · OCTOBER, 1949

CONTENTS

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 32 OCTOBER, 1949 NUMBER 10

EXPERIMENTAL OCULAR HISTOPLASMOSIS*

ROBERT DAY, M.D.
Baltimore, Maryland

Human infection with Histoplasma capsulatum was first described by Darling in 1906,[1] but only during the past 10 years has this disease become of general interest and of possible significance in ophthalmology.

Darling's original case was a 27-year-old Negro of the Canal Zone who, on clinical examination, was thought to have miliary tuberculosis. At autopsy, however, there was found a widespread infection of lungs, liver, spleen, blood, and lymph nodes with a small oviform organism about three microns in diameter. Darling believed it to be a parasite related to the Leishmania of kala azar. It was free in the tissues and was also widely phagocytosed by the reticulo-endothelial cells of the affected organs.

In 1934, the nature of this parasite was established.[2] De Monbreun cultivated a fungus from a fatal infection of a 6-month-old Tennessee infant. This occurred in both a yeast and a mycelial form and produced in monkeys a disease similar to the human infection from which it was recovered.

Conant,[3] in 1941,, made a careful study of the fungus which he classified among the moniliaceae of the Fungi imperfecti. The mycelial form has aerial branching septate hyphae containing large and small, round, pyriform, or tuberculate chlamydospores (figs. 1 and 2). On synthetic media the fungus ordinarily assumes the mycelial form, but in infected animals it appears as a thin-walled, oval, yeastlike cell about 2 by 3μ which reproduces by a single bud from the end of its long axis (figs. 1 and 3).

Prior to De Monbreun's work in 1934, only 11 cases of histoplasmosis had been reported. All ended fatally. Since then, more than 80 additional fatal cases have been described. Parsons and Zarafonetis[4] summarized these up to 1945 and described lesions of skin, mucous membrane, nasopharynx, lymph nodes, lungs, liver, spleen, gastrointestinal tract, and blood. Ocular lesions were mentioned only once, as "small white irregular areas, surrounded by hemorrhage, in the ocular fundi, not unlike tubercles." The eyes from this case, reported by Reid and others in 1942, were unfortunately not obtained at autopsy.[5]

Simultaneous with the increased recognition of the fatal form of the disease, there developed a growing suspicion that nonfatal cases existed, perhaps on a large scale. Pulmonary calcifications, resembling those of tuberculosis, in negative reactors to tuberculin have long been known.[6-11] Various hypotheses have been offered to explain them, such as pneumonoconiosis, skin anergy in tuberculosis, and mycotic infection.

In 1938[6] the study of this problem received impetus from the observation that routine X-ray examination showed an unusually high number of such pulmonary calcifications in persons from Tennessee and neighboring states. In 1943, Dr. C. E. Smith of Stanford University suggested to Dr. Amos Christie of Vanderbilt University that mild histoplasma infections might explain this peculiar abundance of pulmonary lesions in persons insensitive to tuberculin.

* From the Wilmer Ophthalmological Institute of The Johns Hopkins Hospital and University.

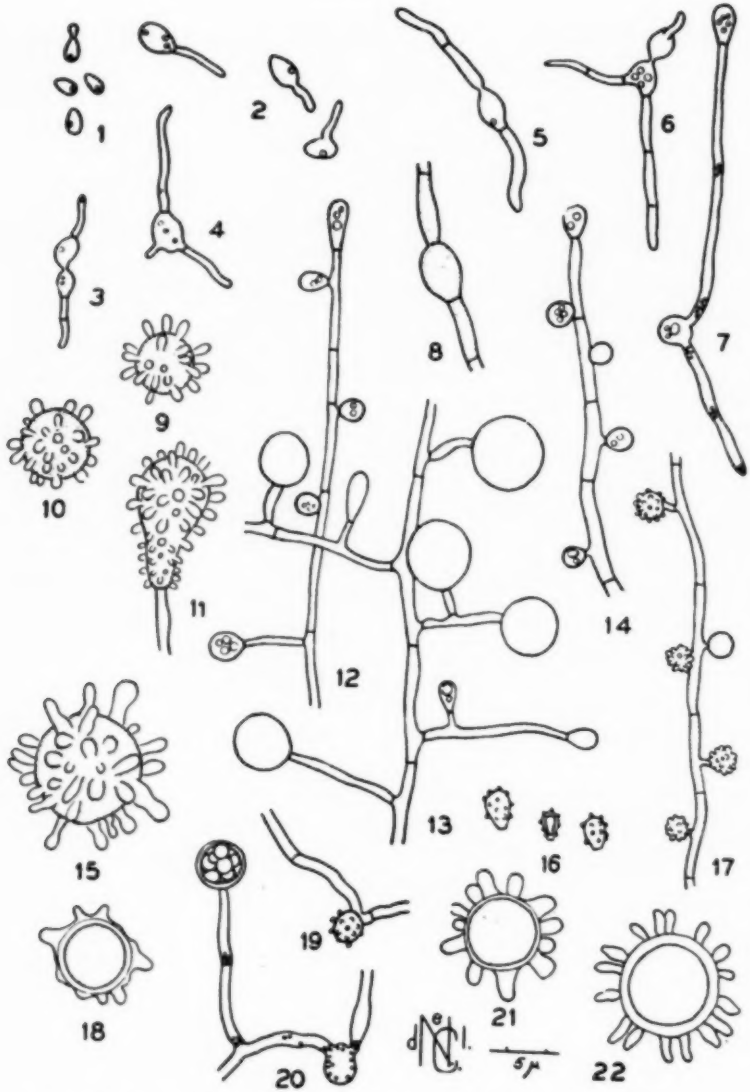


Fig. 1 (Day). Histoplasma capsulatum. (1) represents the yeast form of the fungus. (2 to 22) represent the hyphae and chlamydospores of the mycelial form of the fungus in various stages of development. (N. F. Conant, 1941.)

In 1945, Christie[12] reported the results of a study of Tennessee school children tested with tuberculin and with histoplasmin, an antigen obtained from a broth culture of the mycelial form of the fungus. Seventy-nine of 181 children had pulmonary lesions demonstrable by X ray, resembling those of tuberculosis. Of these 79 only 3 were sensitive to tuberculin alone; 48 were sensitive to histoplasmin alone. Comparable results were

thereafter obtained in other similar studies of both adults and children.[13-18] In spite of the uncertain specificity of the histoplasmin skin test,[19-20] these reports strengthened the possibility that there exists, particularly in the central and east-central United States, a subclinical form of fungus disease which produces lesions not unlike those of tuberculosis.

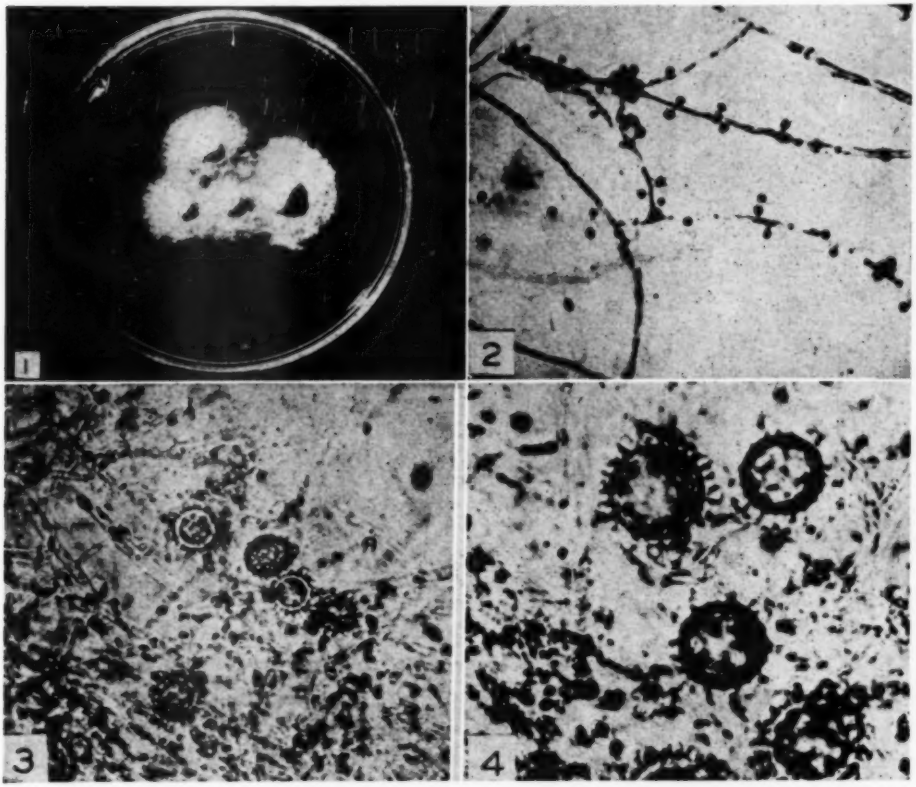


Fig. 2 (Day). Histoplasma capsulatum, mycelial form. (N. F. Conant, 1941.) (1) Gross appearance on Saboraud's agar. (2 to 4) Microscopic appearance of spores and aerial hyphae.

The concept of a nonfatal form of histoplasmosis is further supported by the report in March, 1948, of Bunnell and Furcolow[21] from Kansas City. These observers reported nonfatal infections with Histoplasma capsulatum, 2 in adults and 3 in children. The organism was recovered from all cases. All had positive histoplasma complement fixation reactions;[22] 4 gave positive skin reactions to histoplasmin and negative reactions to tuberculin (the 5th case reacted to both antigens). Four of these patients also had pulmonary calcifications demonstrable by X ray.

A fatal fungus disease, histoplasmosis, is now definitely recognized. This disease produces in many organs granulomatous lesions resembling those of tuberculosis. A milder form of the disease is also recognized, and widespread subclinical or arrested infections are suspected. It seems possible that some cases of granulomatous uveitis may be due to ocular infection with Histoplasma cap-

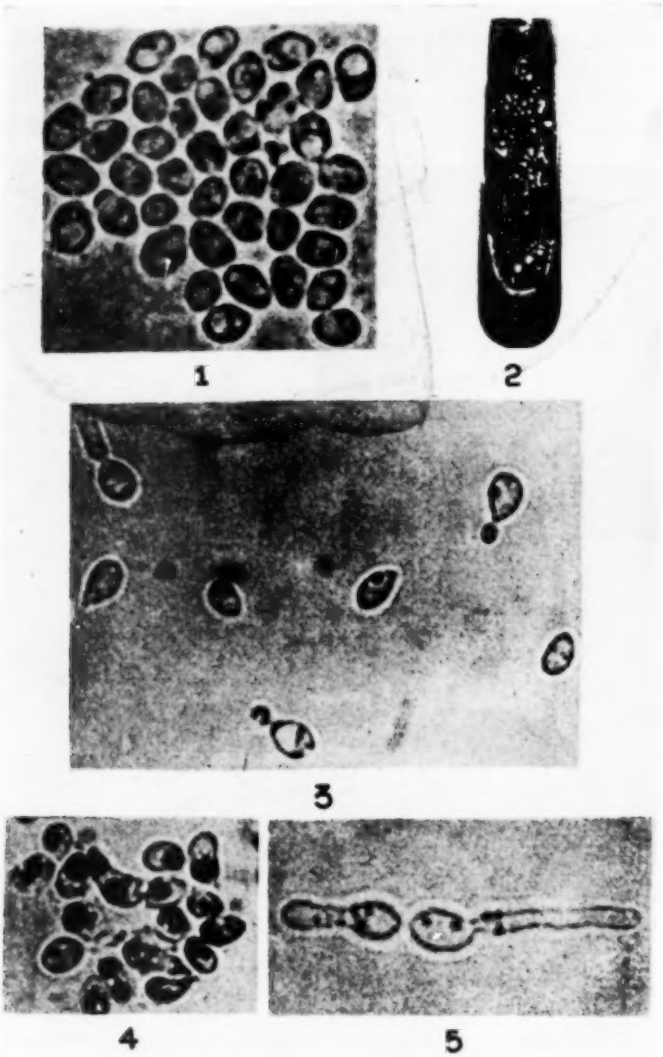


Fig. 3 (Day). Histoplasma capsulatum, yeast form. (2) Gross appearance. (1, 3, and 4) Yeast cells, (5) Transitional form. (W. A. De Monbreum, 1934.)

sulatum. To test this hypothesis preliminary clinical and experimental studies have been made.

A. Clinical studies

One hundred eighteen unselected cases on the public wards of the Wilmer Institute were tested with histoplasmin by intracutaneous injection with 0.1 cc. of histoplasmin (H-15 or H-3), diluted 1:100 and 1:1000. Positive reactions were those in which induration and erythema measured more than 5 mm. in diameter 48 hours after injection. No selection was made either by

race, age, or sex. (The H-15 was obtained through the courtesy of Dr. Arden Howell, and the H-3, through the courtesy of Dr. Chester Emmons, both of the United States Public Health Service.)

Twenty-one of the 118 cases had either active or inactive uveitis. Of the 97 patients without uveitis 29, or 30 percent, gave cutaneous reactions to histoplasmin. This figure compares closely with the 31.9 percent found by Palmer, in 1946, for student nurses of the Maryland area[23] (fig. 4). Fourteen, or 67 percent, of the 21 cases of uveitis had positive skin reactions as compared with 30 percent for the group without uveitis. This difference is unlikely to occur by chance. Four of these 14 histoplasmin reactors did not react to intracutaneous injection with 1 mg. of old tuberculin or with 0.1 cc. brucellergin; they had negative serologic tests for syphilis, were apparently free of foci of infection, and had normal serum albumin/globulin ratios. They did have pulmonary calcifications and were sensitive to histoplasmin. Of these 4, 2 had a single attack of choroiditis, 1 had recurrent choroiditis, and 1 had a single attack of acute granulomatous anterior uveitis. The remaining 10 patients had other positive clinical findings which indicated other possible causes of uveitis.

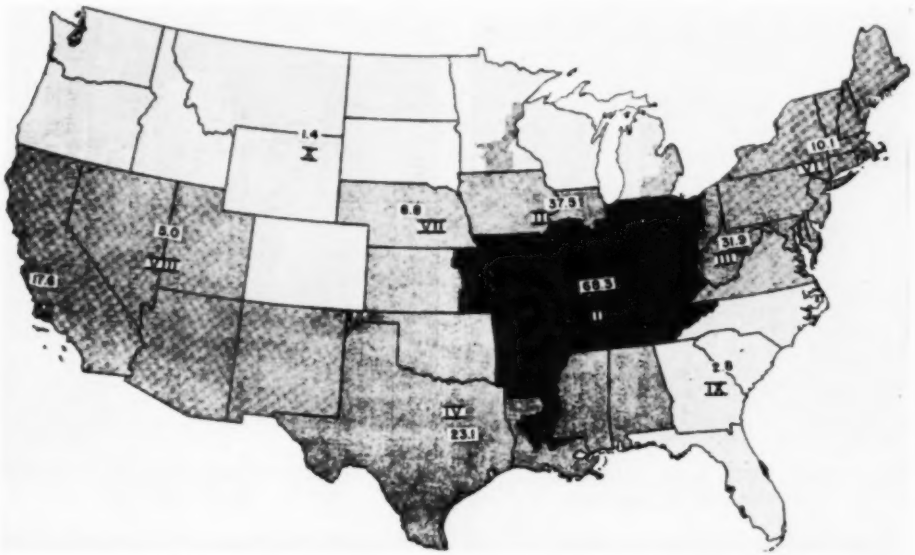


Fig. 4 (Day). Histoplasmin sensitivity among student nurses classified by state of lifetime residence. (C. E. Palmer, 1946.)

B. Experimental studies

In order to study histoplasma infections of the eye, both uninfected and previously infected rabbits were inoculated with the mycelial form of the fungus. The clinical course and histologic picture were then studied.

1. The ocular reaction in normal rabbits

Seventeen eyes in 15 previously uninfected young adult albino rabbits were injected with living spores via the anterior chamber. The technique of the injection was as follows:

The fungus was scraped from a two weeks' growth on Saboraud's agar at room

temperature, was then suspended in saline, and ground to a smooth suspension with a sterile mortar and pestle. A spore count was then made with a blood-counting chamber. The suspensions contained from 125,000 to 3,000,000 spores per cc. Using a sterile syringe and hypodermic needle, 0.05 to 0.2 cc. of aqueous was removed from the anterior chamber. An equivalent amount of the suspension was then injected by the same needle without removing it from the anterior chamber. From 10,000 to 300,000 spores were thus introduced.

Ten eyes in 10 rabbits developed nodular iritis. An inflammatory reaction followed within 24 hours after infection. The iris and pericorneal vessels became dilated and an exudate appeared in the pupillary space, over the anterior iris, and frequently on the posterior cornea. This immediate reaction either subsided within a week, leaving the eye quiescent for 2 or 3 weeks, or, in most cases, persisted without appreciable change for 1 or 2 weeks.

In those eyes in which the initial reaction subsided, iris nodules appeared 1 to 4 weeks after infection. These were single or multiple, but, even when apparently solitary by reflected light, could often be seen on transillumination as minute opacities seeded throughout the iris. These scattered nodules grew larger, the iris vessels became more dilated, and, within a week or two, a diffuse exudative nodular iritis occurred (figs. 5, 6, and 7). Within another 1 to 2 weeks, the angle in most cases became blocked and secondary glaucoma developed with vascularization and edema of the cornea (fig. 8). After 2 to 4 weeks of severe inflammation and progressive buphthalmos, the signs of inflammation began to subside (fig. 9). The total period of acute inflammation was thus 4 to 6 weeks. At this interval after infection, the skin test became positive. Two to 3 months after infection, the eyes were quiescent with nodular scars in the irides and leukomatous corneas.

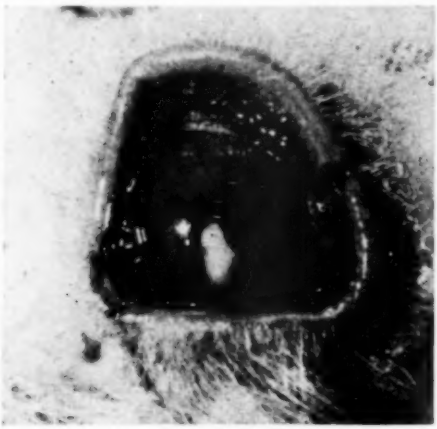


Fig. 5 (Day). Rabbit D-10, L.E. Two weeks after infection with H. capsulatum.

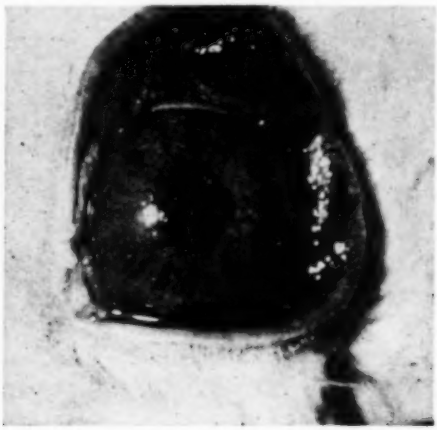


Fig. 6 (Day). Rabbit D-22, L.E. Three weeks after infection with H. capsulatum.

The eyes in which the initial inflammation failed to subside developed a severe nodular iritis 1 to 2 weeks after infection (fig. 10). This led to a buphthalmos and corneal scarring indistinguishable from that of the less fulminating form of iritis described in the last paragraph.

Five eyes in 5 normal rabbits developed buphthalmos within the first week after in-

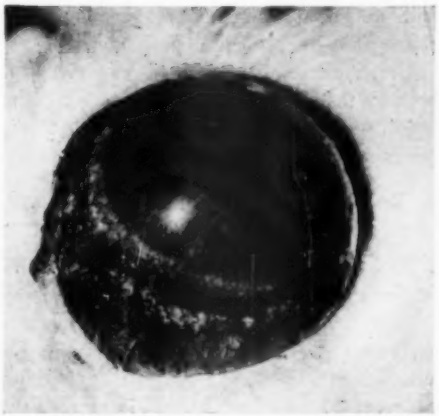


Fig. 7 (Day). Rabbit D-6, L.E., Six weeks after infection with H. capsulatum.

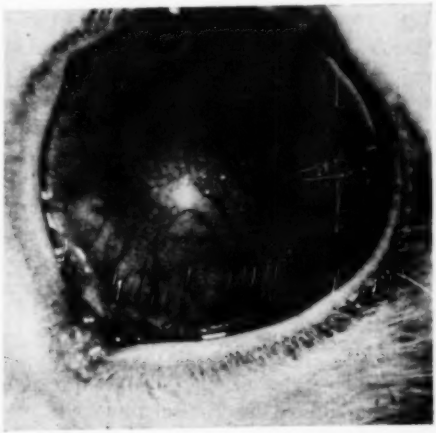


Fig. 8 (Day). Rabbit D-14, L.E. Six weeks after infection with H. capsulatum.

fection, thus making it impossible to follow the course of the disease. However, in these rabbits the skin test to histoplasmin became positive, and yeast cells were found in 3 eyes on microscopic examination. The corneal scarring and buphthalmos were indistinquishable from that already described.

Two of the above rabbits were infected simultaneously in both eyes; one eye was removed from each rabbit a week after infection, before the development of a nodular iritis.

2. Development of cutaneous sensitivity

All rabbits were initially insensitive to 0.1 cc. of a 1:10 dilution of H-3 histoplasmin given intradermally. The animals were then given periodic intracutaneous injections with 0.1 cc. H-3 histoplasmin (1:10 and 1:100).

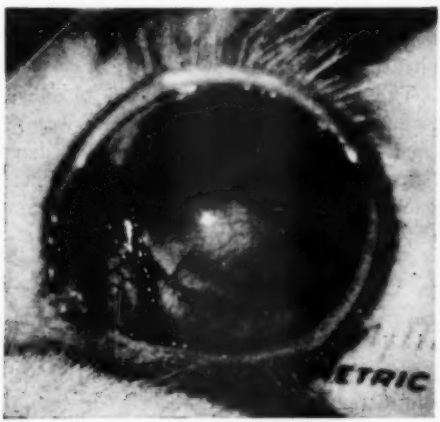


Fig. 9 (Day). Rabbit D-10, L.E. Ten weeks after infection with H. capsulatum.

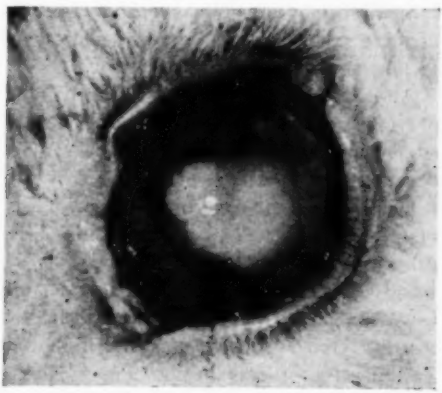


Fig. 10 (Day). Rabbit D-11, L.E., Two and one-half weeks after infection with H. Capsulatum.

A few rabbits were skin sensitive to H-3 (1:10) 2 to 4 weeks after infection. The majority became skin sensitive in 4 to 6 weeks. By the end of the 6th week after infection all rabbits but one, regardless of the route of infection, were skin sensitive to 0.1 cc. of 1:10 and 1:100 H-3. The organism was recovered by culture, however, from the insensitive rabbit 6 months after infection.

3. The ocular reaction in previously infected rabbits

In order to determine whether previous infection altered the clinical course of subsequent reinfection, 8 of the 15 rabbits used in the initial experiment were reinfected in the anterior chamber of the other eye from 2 to 14 weeks after the original infection and after enucleation of the previously infected eye. None of the previously uninfected eyes showed clinical signs of disease at the time of reinfection.

Five eyes were inoculated in 3 rabbits given previous extraocular infection. One of these received an intravenous injection of 1,000,000 spores 1 month before the ocular injection. The other 2 rabbits received 500,000 spores each by retrobulbar inoculation 1 month and 2 months respectively before the ocular injection. None of the eyes of these rabbits showed signs of clinical infection at the time of reinfection.

Altogether 13 eyes were inoculated in 11 previously infected rabbits. Seven of the 13 eyes were in 5 rabbits which had been inoculated 2 to 4 weeks previously, either systemically or in the anterior chamber. Three of these eyes developed nodular iritis, 2 developed buphthalmos and simultaneous iritis, 1 had a bacterial panophthalmitis, and 1 eye was enucleated a few days after infection so that its clinical course was not followed. The disease process in these eyes closely resembled that in the primary infections already described.

The remaining 6 eyes, in 6 rabbits, originally infected 6 to 14 weeks previously, had an initial inflammatory reaction after reinfection but failed to develop iritis.

Under the conditions of this experiment it appears that some immunity is conferred by ocular or systemic infection and that this immunity develops its effect in 4 to 6 weeks.

4. The ocular reaction after intravenous injection

Five rabbits were given intravenous injections of the fungus. One case of spontaneous ocular infection occurred. This rabbit received an initial injection via an ear vein of 1,000,000 spores. Two weeks later he received 1,500,000 spores intravenously. Four weeks after the original injection he was skin sensitive to 0.1 cc. 1:100 H-3. Three months after the original injection, a third intravenous injection of 1,125,000 spores was given, and 3 weeks later, a fourth injection of 1,500,000 spores.

One week after the last injection, the pupil of the left eye was peaked from the 1- to 5-o'clock positions. There was a bloody exudate in the lower anterior chamber. The aqueous was clouded with a fibrinous exudate. A good red reflex was obtained but no fundus details could be made out. During the next 2 weeks the eye whitened, but the pupil remained peaked at the 3-o'clock position and there appeared to be a mass behind the iris at that point. There were many coarse intravitreous opacities.

The eye was enucleated. On histologic examination the positive findings were a small collection of round cells in the ciliary body, a few round cells in the vitreous, and one giant cell in the ciliary body which contained no yeast cells.

5. The ocular reaction after intravitreous and retrobulbar injection

Localized vitreous abscesses developed in 4 eyes of 2 rabbits following intravitreous inoculation. These progressed for 1 to 2 weeks and then slowly regressed, leaving heavy localized opacities.

No clinical change was observed in the

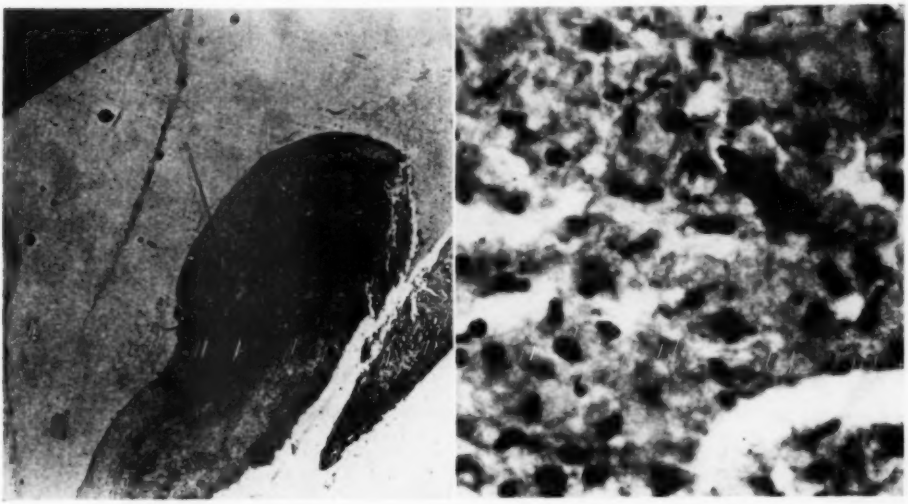


Fig. 11 (Day). Rabbit D-1, L.E. One week after infection with H. capsulatum. Exudate in anterior chamber, round cells, a few polys, and mycelial debris. (Left ×35; right ×600.)

eyes of 2 rabbits following retrobulbar injection.

6. The ocular reaction after inoculation with heat-killed spores

Three eyes in 3 rabbits were inoculated in the anterior chamber with heat-killed spores. These eyes, except for an initial inflammatory reaction which subsided within a week, did not develop iritis.

7. Summary of ocular reactions

To recapitulate, normal rabbits when injected via the anterior chamber with a saline suspension of the mycelial form of Histoplasma capsulatum developed a nodular iritis which led to secondary glaucoma, buphthalmos, and the loss of the eye.

The interval between infection and the appearance of the nodular iritis varied with the size of the infecting dose. Animals in-

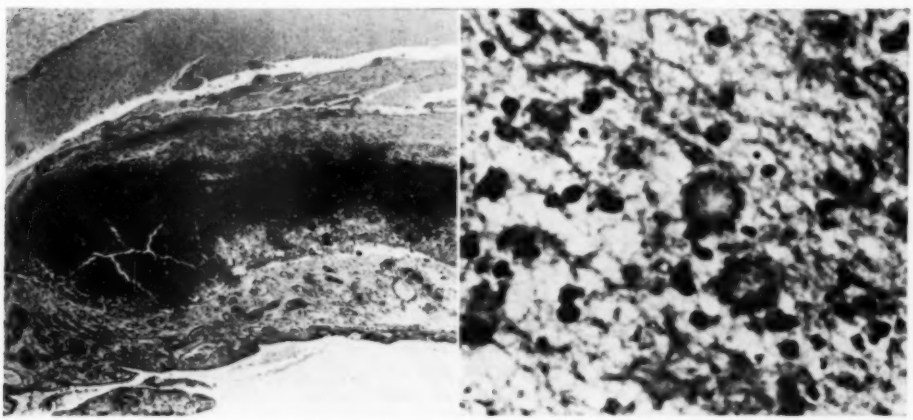


Fig. 12 (Day). Rabbit D-1, R.E. One week. Massive exudate in anterior chamber, polys, round cells, fibrin. Note two spores near center of high-power photomicrograph (right ×600). (Left ×35.)

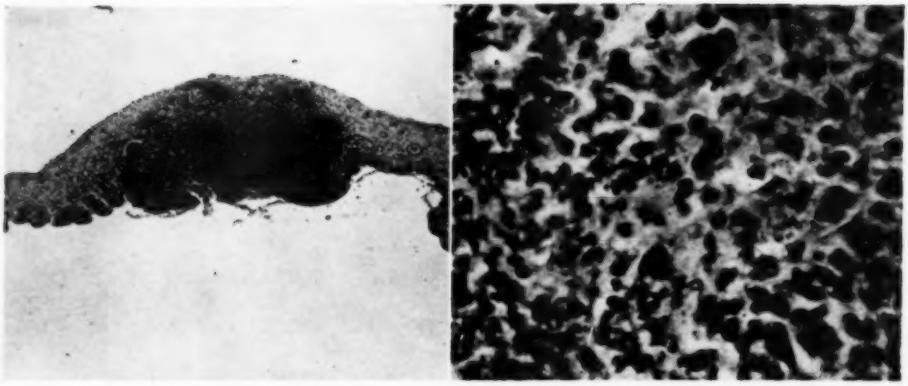


Fig. 13 (Day). Rabbit D-5. One month. Iris, left eye. A few intracellular yeast cells. (Left ×35; right ×600.)

fected 1 to 3 months previously appeared to have considerable resistance to reinfection via the anterior chamber and this resistance seemed to be coincident with the appearance of skin sensitivity to histoplasmin.

The ocular reaction was thus analogous to that of immune-allergic animals upon reinfection with the tubercle bacillus. Ocular histoplasmosis, in fact, resembles ocular tuberculosis, not only in this apparent immunity but also in the granulomatous nature of the lesion and in its destructiveness. The organism is also believed to cause benign pulmonary calcifications almost identical by X-ray examination with those of tuberculosis.

C. Histologic study

Two routine histologic sections were made of each eye, the first stained with hematoxylin and eosin, and the second either by the Bauer technique[24] or by the periodic-acid method developed by Hotchkiss, McManus,[25-26] and others. The two latter methods are used to stain polysaccharides and will stain the yeast form of Histoplasma capsulatum.

Miscroscopic study of the eyes removed during the first week after infection gives a

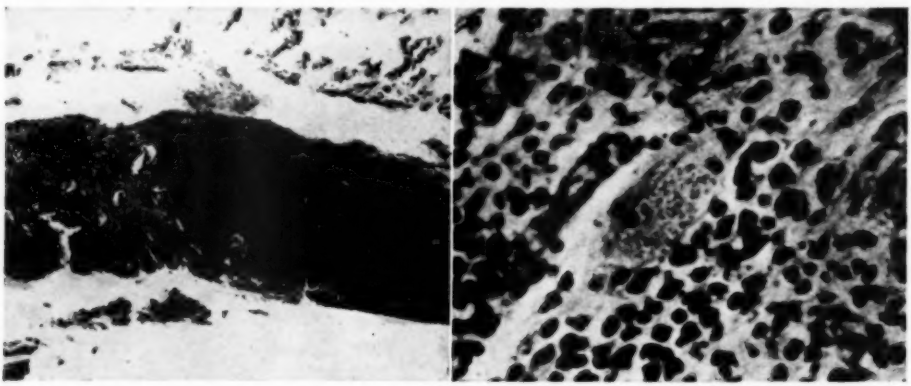


Fig. 14 (Day). Rabbit D-6. Two months. Iris, left eye. Note intracellular yeast cells in high-power photomicrograph (right ×600). (Left ×35.)

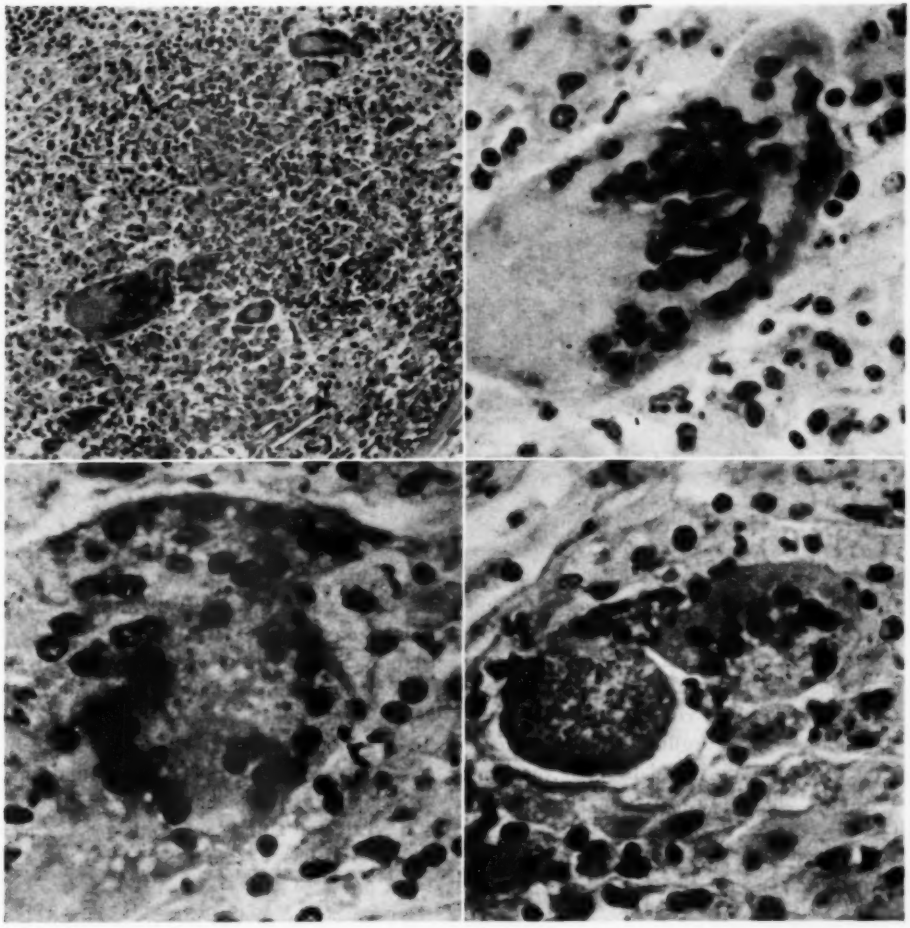


Fig. 15 (Day). Rabbit D-9. One month. Iris, right eye. In figure at lower right (×600) there are numerous intracellular yeast cells; at lower left (×600) there are fewer. The giant cell in figure at upper right (×600) contains possibly 1 or 2 organisms. (Upper left ×140.)

variable picture, dependent upon the degree of immunity and the size of the infecting dose. The less violently inflamed eyes show a few spores and a small amount of mycelial debris in the anterior chamber; a few polymorphonuclear and mononuclear white blood cells on the posterior cornea, on the anterior iris, and in the iris stroma; and an occasional intracellular phagocytosed yeast cell (fig. 11). The more violently inflamed eyes show marked exudate, debris, polys, spores, and yeast-containing macrophages in the anterior chamber, and marked edema of the iris with a variable infiltration of the iris stroma and ciliary body with macrophages, other round cells, occasional epithelioid cells, and rare giant cells (fig. 12).

With the appearance of the iris nodules, a granulomatous picture predominates (figs. 13 and 14). In some eyes there is a nodular infiltration of the iris with round cells, epithelioid cells, and a few polymorphonu-

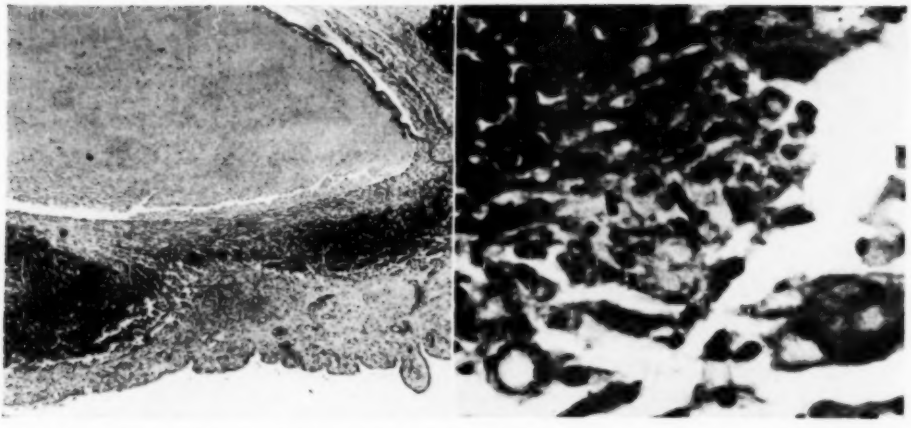


Fig. 16 (Day). Rabbit D-11, L.E., Two and one-half weeks. Note the spore in the lower left corner of the high-power photomicrograph. These are not often seen at this stage of infection. (Left ×35, right ×600.)

clear leukocytes. Yeast cells can be seen within mononuclear wandering cells (figs. 13 and 14). In other eyes there are, in addition, many giant cells in some of which large numbers of yeast cells can be seen, apparently in various stages of digestion (fig. 15). There is considerable tissue destruction, usually beginning 4 to 6 weeks after infection, and, in many eyes, there are abscesses of cornea, iris, or ciliary body (fig. 16).

Two to 3 months after infection while the clinical signs of inflammation are subsiding, in addition to glaucomatous or phthisical changes, the eyes still show extensive round-cell infiltration of the anterior uveal tract and a few polymorphonuclear leukocytes. Some eyes have localized abscess of the iris or ciliary body, characterized by central necrosis and peripheral collections of round cells, epithelioid cells, giant cells, and yeast-containing macrophages, with a

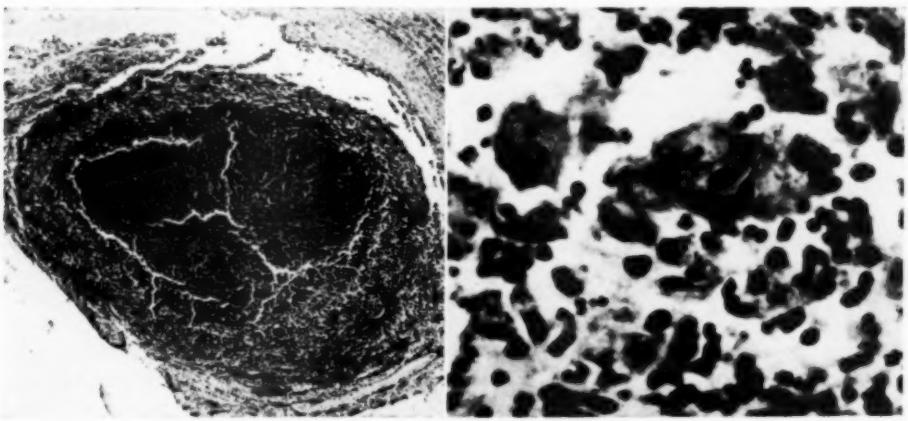


Fig. 17 (Day). Rabbit D-17. Iris, left eye. Three months. Abscess with necrotic center and peripheral granuloma.

few polymorphonuclear cells scattered among them, not unlike the lesions of experimental ocular brucellosis (fig. 17). Most of the eyes examined at 3 months or later have extensive round-cell infiltration of the uvea without visible giant cells, and with few epithelioid cells. They present the picture of a nonspecific subsiding granulomatous inflammation (fig. 18). Phagocytosed yeast cells are seldom seen in the late stages, yet from one eye in which no organisms were visible by microscopy, they were recovered by culture six months after infection.

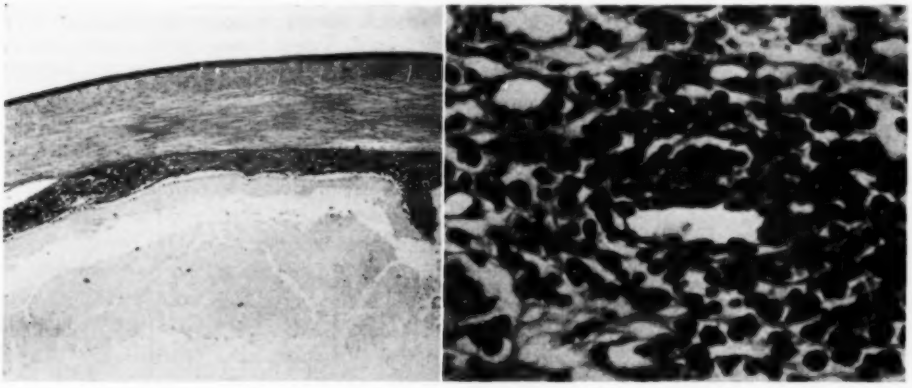


Fig. 18 (Day). Rabbit D-18. Iris and cornea, left eye. Three months. Subsiding granuloma.

Comment

What bearing do the foregoing fragmentary data have upon the possibility of human ocular histoplasmosis?

It is credible from the work of Furcolow, Bunnell, Christie[21,12] and others that a nonfatal form of systemic histoplasmosis exists in human beings. Four patients with acute uveitis have now been observed, all of whom had skin sensitivity to histoplasmin and benign pulmonary calcification, yet had negative results from other routine clinical studies. In these patients the existing evidence points to the possibility that histoplasmosis was the cause of their ocular infection.

The injection of Histoplasma capsulatum into the anterior chamber of rabbit eyes produces a destructive granulomatous anterior uveitis closely resembling tuberculosis in its clinical appearance, but apparently self-limited in course. Systemic infection in rabbits may result in ocular involvement. Infected animals, as in tuberculosis, tend to develop resistance to reinfection and become skin allergic to an extract derived from the infecting organism. The infection tends to subside and the organism to disappear from the eye following the development of skin sensitivity to histoplasmin. These facts are circumstantial evidence in support of histoplasma uveitis.

On the other hand, there is as yet no direct proof that the organism can produce subclinical or recurrent human infection anywhere in the body. There is no direct proof that the disease causes uveitis in human beings. The final proof must be the isolation of the fungus from the suspected case. There are to date insufficient data as to the duration of viability of the organism within the rabbit eye, but the evidence indicates a steadily decreasing viability which parallels the clinical course of the experimental disease. It is noteworthy, however, that the fungus was recovered from a clinically quiescent eye 6 months after infec-

tion. If the human disease exists and is analogous to the rabbit infection, the organisms and typical lesions are likely to be found only during the acute phase. Further clinical and histologic study of Histoplasma capsulatum as a possible cause of ocular disease is necessary in order to distinguish it from other causes of granulomatous uveitis.

Summary

1. A brief review of the history of systemic infection with Histoplasma capsulatum has been made.

2. A significantly higher percentage of patients with uveitis reacted positively to skin testing with histoplasmin than of patients without uveitis. Four of these patients had a positive skin test to histoplasmin, pulmonary calcification, and uveitis as the only positive clinical findings.

3. Rabbits can be infected via the anterior chamber with Histoplasma capsulatum and develop a granulomatous anterior uveitis which is apparently self-limited in course.

The Johns Hopkins Hospital (5).

This work was made possible by the generous coöperation of Dr. Chester W. Emmons, chief mycologist, United States Public Health Service and Dr. R. E. Dyer, director, National Institute of Health.

Figures 1 to 4 are reproduced through the courtesy of Dr. Norman F. Conant of Duke University, Dr. W. A. De Monbreun of Vanderbilt University, and Dr. Carroll E. Palmer of the United States Public Health Service.

References

1. Darling, S. T.: J.A.M.A., **46**:1283, 1906.
2. De Monbreun, W. A.: Am. J. Trop. Med., **14**:93 (Mar.), 1934.
3. Conant, N. F.: J. Bact., **41**:536 (May), 1941.
4. Parsons, R. J., and Zarafonetis, C. J. D.: Arch. Int. Med., **75**:1, 1945.
5. Reid, J. D., *et al.*: J. Lab. and Clin. Med., **27**:419 (Jan.), 1942.
6. Gass, R. S., *et al.*: Amer. Rev. Tuberc., **28**:441-447, 1938.
7. Lumsden, L. L., and Dearing, W. P.: Am. J. Pub. Health, **30**:219-228, 1940.
8. Long, E. R., and Stearns, W. H.: Radiology, **41**:144, 1943.
9. Sayers, R. R., and Meriwether, F. V.: Am. J. Roentgenol., **27**:337-351, 1932.
10. Nelson, W. E., Mitchell, A. G., and Brown, E W.: Am. Rev. Tuberc., **37**:311-314, 1938.
11. Crimm, P. D., and Short, D. M.: Am. Rev. Tuberc., **39**:64-49,, 1939.
12. Christie, Amos, and Peterson, J. C.: Am. J. Pub. Health, **35**:1131-1147, 1945.
13. Carroll E. P.: Pub. Health R., **60**:513-520, 1945.
14. High, R. H., Zwerling, H. B., and Furcolow, M. L.: Pub. Health Rep., **62**:20-29 (Jan.), 1947.
15. Sontag, L. W., and Allen, J E., J. Pediat., **30**:657-667, 1947.
16. Furcolow, M. L., High, R. H., and Allen, M. F.: Pub. Health Rep., **61**:1132-1144, 1946.
17. Ferebee, S. H., and Furcolow, M. L.: Pub. Health Rep., **62**:834-847, 1947.
18. Furcolow, M. L., Mantz, H. L., and Lewis, I.: Pub. Health Rep., **62**:1711-1718, 1947.
19. Emmons, C. W., *et al.*: Pub. Health Rep., **60**:1383, 1945.
20. Arden H.: Pub. Health Rep., **62**:631, 1947.
21. Bunnell, I. L., and Furcolow, M. L.: Pub. Health Rep., **63**:299, 1948.
22. Furcolow, M. L., Bunnell, I. L., and Tenenberg, D. J.: Pub. Health Rep., **63**:169-173 (February), 1948.
23. Palmer, Carroll E.: Pub. Health Rep., **61**:475-487 (April), 1946.
24. Bauer, H.: Ztschr. f. mikr.-anat. Forsch., **33**:143-160, 1933.
25. Hotchkiss, R. D.: Arch. Biochem., **16**:131-141, 1948.
26. McManus, J. F. A.: Stain Technol., **23**:99 (July), 1948.

HISTAMINE AND UVEAL INFILTRATION*

T. F. SCHLAEGEL, JR., M.D.
Indianapolis, Indiana

Because of the importance of allergy in the etiology of uveitis it was considered desirable to determine what histologic effect the ocular injection of histamine has upon the attraction of leukocytes.

A review of the literature indicates that histamine is not chemotactic for leukocytes although not all experiments along this line are in agreement.

In 1921, Wolf[1] published the results of her study on the influence of chemicals upon the chemotaxis of leukocytes in vitro. She found that histamine was strongly and positively chemotactic in molecular concentrations of over 0.000,025 percent. In 1922, Bloom[2] reported on the reaction of the cat to histamine dihydrochloride. He found practically no difference between the effects produced by injections of histamine in physiologic saline and of physiologic saline alone. Also glass tubes containing the histamine did not attract leukocytes either in vivo or in vitro. In 1923, Wolf[3] continued her studies on chemical inflammation, this time in vivo, and concluded that histamine produces a marked inflammatory reaction in frogs and mice.

In 1928, Grant and Wood[4] said that, since it seemed impossible to reconcile these conflicting results, they repeated Wolf's observations on the frog and made others on the rabbit and on human skin. Throughout their experiments they used 0.5-percent histamine acid phosphate dissolved in physiologic saline with the addition of sodium hydrate immediately before use to give a pH of 7.3. As a control a phosphate buffer solution of the same pH was employed.

They found that in frogs the mesenteric circulation remained active, no diapedesis of red cells took place, and no emigration of leukocytes could be detected until after 80 to 227 minutes, at which time emigration was found in mesenteries irrigated with phosphate solution alone or in those allowed to become dry.

In experiments on human beings, histamine was pricked into the skin and, when the vascular reaction was at its height, 20 minutes later, sections showed no leukocytic migration. In another subject the local reddening and whealing was maintained for 9 hours by pricking histamine into the same spot every 40 minutes. No increase in leukocytes was found except along the needle tract. The experiment was repeated and maintained for 25 hours with a control of phosphate solution. Microscopic examination failed to differentiate the two, there being leukocytes along the needle tract in both cases.

In 1928, Findlay[5] inoculated rabbits intravenously with staphylococci, streptococci, or pneumococci, 24 hours after several intradermal injections of histamine. Polymorphonuclear leukocytes were found diffused throughout the area injected with histamine, while in the area injected with a control of phosphate solution they were few and far between. Findlay's experiments thus indicate that histamine may act by favoring the localization of bacteria.

In 1934, Morgan[6] used histamine acid phosphate in a physiologic solution of sodium chloride on guinea pigs, rabbits, dogs, and human beings. An attempt was made to produce an inflammatory reaction in the rabbit by applying histamine by various methods. The conclusion was reached that histamine, when repeatedly instilled into the conjunctival sac, applied to the intact, burned, scratched, or cut skin for as long as 72 hours, or repeatedly injected into the muscle of the rabbit, does not produce an inflammatory reaction.

* From the Research Division and the Department of Ophthalmology of the Indiana University Medical Center.

Another experiment consisted of producing a wheal with histamine and one of equivalent size by the injection of a physiologic solution of saline. Microscopic examination failed to demonstrate any difference between the areas into which the saline solution was injected and the areas in which wheals were produced by histamine.

Both tissues showed a diffuse infiltration of leukocytes with a slight concentration of white cells around the point of injection. Since there was a rapid increase of fluid in both cases, Morgan felt that the tearing and distortion of the cellular structures liberated products of tissue disintegration.

In 1935, Moon[7] reported experiments following the technique of Wolf and with modifications of it in vitro and did not note increased migrations of leukocytes toward inert substances containing various concentrations of histamine.

Moon then performed experiments to obtain further evidence on this point in vivo. Cylindric bits of elder pith of uniform size were cleared of soluble substances and then saturated with a physiologic solution of sodium chloride containing histamine phosphate in a 1:10,000 solution and were implanted in animal tissues through a canula. Some were introduced into the peritoneal cavity and others into the loose subcutaneous areolar tissue. In every instance a bit of elder pith saturated with physiologic solution of sodium chloride was similarly implanted as a control. Plugs saturated with histamine were implanted in 9 monkeys, 8 cats, and 4 guinea pigs. After from 6 to 24 hours the animals were killed and the reaction about the histamine pith was compared to that of the control.

In every instance, there was a marked zone of congestion about 2 cm. in diameter surrounding the pith saturated with histamine, but none about the controls. Microscopic examination revealed numerous leukocytes about both test and control piths. There was no evidence of active invasion of the pith by cells, and leukocytes were apparently as numerous about the control piths as about the ones containing histamine.

Moon also concluded that the evidence indicated that some product of cellular injury, other than histamine, is responsible for the local attraction of leukocytes.

Soon afterwards Menkin[8] demonstrated a factor in inflammatory exudates. This factor was later found to be a crystalline nitrogenous substance and was called leukotaxine.[9] It is capable of increasing capillary permeability and of attracting leukocytes. Within 15 to 30 minutes following its intracutaneous inoculation, polymorphonuclear leukocytes accumulate in abundance in the lumen of small vessels and then soon migrate actively into the extracapillary spaces.[10] Menkin gave repeated evidence that leukotaxine was not histamine and in no way related to it.[11-13]

In 1942, Rigdon[14] reopened the question of the chemotactic property of histamine. Using histamine phosphate diluted in saline to 1:1,000 to 1:8,000, he found that polymorphonuclear leukocytes were present in the extravascular tissues of the rabbit usually within an hour following the injection. The number of these cells appeared to increase during the following 4 to 5 hours and then to decrease. Control experiments apparently were not done, so Rigdon's conclusion that histamine phosphate was the chemotactic agent is to be questioned.

Experiments

Although a review of the literature indicates that histamine has no unique chemotactic properties, it was decided to extend such experimentation to rabbit eyes. The problems of allergic uveitis focused attention on the reaction in the uvea. The uvea is prone to develop a cellular infiltration. For example, an injection of horse serum into the vitreous of normal rabbits results in cellular infiltration that is confined almost entirely to the uvea.[15]

Preliminary tests

Part 1

The effect of two readily available strengths of histamine acid phosphate were compared (ampule form, 0.275 percent and vial form, 0.055 percent). Eight rabbits, divided into two groups, received injection of 0.1 cc. of the ampule or vial strength into the vitreous. After killing the animals by air embolism, the eyes were enucleated at 6 hours and at 1 week.

Clinical observations. One and one-half hours after the injection of either strength of histamine, a moderately severe chemosis was present. The pupils were contracted to a diameter as small as 2 mm. (The average apparent diameter of the pupils of 64 normal rabbit eyes under the same conditions of illumination was 7 mm.) After 4 hours the chemosis and miosis were unchanged, but at 6 hours there was beginning abatement.

Ophthalmoscopy at this time revealed haziness of the vitreous and slight dilatation of the retinal vessels. After 24 hours, the pupils were normal in size and the chemosis almost gone. The fundi showed no definite changes. Four days later the eyes were normal and remained so until the enucleation at 1 week.

Microscopic study. No significant histopathologic features were noted in any of the eyes.

Part 2

In this second experiment the vial strength (0.055 percent) was used and repeated injections were employed to determine whether it was possible to attract leukocytes by means of repeated injections of histamine. Six rabbits each received 0.1 cc. in the vitreous of the right eyes 7 mm. behind the limbus in the 12-o'clock meridian. The left eyes served as untreated controls. Such injections were given regularly on Monday, Tuesday, and Wednesday. Two rabbits were killed on Thursday for each of 3 weeks.

Clinical observations. In general the reactions in the anterior ocular segment of the right eyes were similar to those recorded in Part 1. Some signs of iritis, such as blurring of the iris pattern, were observed early. It was soon impossible to see the fundi because of clouding of the media.

Repeated injections caused changes in the lens producing posterior opacities while the vitreous was made very hazy. An increase of mucoid conjunctival discharge was common. In general the reaction to each injection of histamine became less as the experiment progressed, although definite evidence of endophthalmitis developed in some of the eyes.

Microscopic study. No significant differences were found between the 1, 2, and 3-week periods. A moderate infiltration of polymorphonuclear leukocytes was seen external to the sclera and in the region of the injection site, but the main finding was of endophthalmitis. A moderately heavy collection of polymorphonuclears was seen in the vitreous, lying especially behind the lens, over the ciliary body, and internal to the retina. A minimal accumulation of mononuclear cells in the choroid of some of the eyes was considered to be of no significance because: (1) such an infiltration is seen occasionally in the eyes of apparently normal rabbits, (2) such an infiltration in the presence of a severe endophthalmitis is to be expected.

Main experiment

To subject the question of whether the uvea will react to histamine by a cellular infiltration to a more refined test, an attempt was made to place the fluid in the suprachoroidal space in direct contact with the choriod, and to study the histologic response at frequent intervals from 15 minutes to 3 days.

This time a control solution was made by adding 0.066 M. phosphate buffer of pH 7 to distilled water to make a solution that had a pH of 6.81 after autoclaving. The 0.275-

percent histamine acid phosphate was diluted with the phosphate buffer and distilled water to a strength of 0.055 percent and its pH brought up to the same level by the addition of a few drops of 10 percent NaOH. These two solutions were cultured before use and found to be sterile.

Under pentothal anesthesia an anteroposterior incision was made through the sclera over the pars plana. A beveled 23-gauge needle with blunted tip was introduced with the bevel hugging the inside of the sclera and was passed posteriorly for 5 to 8 mm. Where the injection of the 0.1 cc. was made.

Eighteen rabbits were used. Histamine was injected into the right eyes and the phosphate control into the left eyes. Two at a time the rabbits were killed by air embolism and their eyes enucleated at 15 and 30 minutes, at 1, 2, 4, and 6 hours, and at 1, 2, and 3 days.

Clinical observations. Clinically chemosis and miosis were observed in both eyes, but they were usually more pronounced in the right eyes injected with histamine.

Microscopic study. There is no significant histopathologic differences between the right eyes injected with histamine and the left eyes injected with the control solution except for more edema in the ciliary region of the histamine injected eyes. The following chronological survey of the more important histologic features, therefore, will consider both groups together and point out only the changes with time. The irides of most of the eyes of all stages present a bulge suggestive of iris bombé, although no evidence of posterior synechias is noted.

15 and 30 minutes

Suprachoroidal hemorrhage and detachment of the choroid are found at this period and in most of the eyes of the following stages.

1 hour

There is added a definite edema of the ciliary body, especially the processes. Chemosis of the conjunctiva is prominent and is accompanied by an infiltration of polymorphonuclear leukocytes.

4 and 6 hours

There are large cysts on the ciliary processes filled with edema fluid. Polymorphonuclear leukocytes are found outside the sclera and in its superficial lamellas. There are also a few polymorphonuclears in the suprachoroidal space, but those in the chemotic conjunctiva are beginning to be replaced by large mononuclear cells and fibroblasts.

1 day

At 1 day there is added definite round-cell infiltration of the pars plana and most of the choroid has small flat areas of mild lymphocytic infiltration.

2 and 3 days

The reaction appears to be waning. There are a few round cells in the ciliary body and choroid and a severe congestion of the ciliary processes.

No difference in cellular infiltration between the histamine and control eyes is noted at any stage.

Comment

A number of investigators have studied the effects of histamine upon the pupil and upon the intraocular pressure,[16-19] but as far as I know Alajma and Friedenwald are the only ones who have reported microscopic findings.

After the injection of histamine into the vitreous, Alajma[20] found an intense plastic uveitis which, on sectioning, showed an area of infiltration containing large numbers of eosinophils.

Friedwenwald[21] injected histamine into the eyes of dogs, cats, rabbits, and monkeys in an experimental study of acute congestive glaucoma. He found a marked edema of the ciliary body with extravasations of serum and fibrin about the capillaries just beneath

the epithelium. The ciliary processes were much swollen, especially at their tips, which were sometimes distended so as to form great bags filled with serum. The irides showed varying degrees of edema, usually less intense than that found in the ciliary body. Coagulated serum was found in the anterior, posterior, and vitreous chambers. In some instances there was slight bullous keratitis, and often marked conjunctival edema. Friedenwald did not mention the presence of wandering cells and the sections photographed do not indicate their presence.

Although our experimental methods differed, many of the features described by Friedenwald were observed.

The use of rabbits as experimental animals might be criticized. Darsie and others[22] found that, after the intradermal injection of various strengths of histamine diphosphate, no wheals developed in guinea pigs, rabbits, and cats, but they did develop in dogs, goats, and man. In the first group, not developing wheals, histamine results in vasoconstriction, while in the second it produces vasodilatation.

It is probable that a vascular reaction is the fundamental response to sensitization. This vascular reaction, however, is one of arteriolar constriction with stoppage of circulation and the migration of leukocytes, while histamine, in man, produces an active hyperemia by arteriolar and capillary dilatation.

From our review of the literature there was no evidence that the various animals, including man, showed any differences in the leukocytic response to injections of histamine. The consensus appears to be that histamine in itself does not attract leukocytes in any of those animals.

Histamine is commonly incriminated as the cause of allergic reactions. Although histamine undoubtedly plays a role in some allergic responses, it must be remembered that many other factors are involved. In fact, to explain the many different manifestations of allergy it can be assumed either that some toxic agent is liberated, different for the various types of allergic response, each to produce its own special effect, or that the specific antibody permits the antigen to exert its own effect upon the sensitized cell.[23] This conception postulates unknown allergotoxins in addition to histamine.

The question of why wandering cells were attracted, although in small numbers, by both the histamine and the buffer control, seems to be answerable by one or both of two mechanisms. It is possible that the distention by fluid liberated a product of cellular injury, such as leukotaxine, which then attracted leukocytes; or it is likely that bacteria were introduced either at the time of the operation or subsequent to it. The fact that wandering cells were much more common in the main experiment, in which an incision was made with a knife, than in the first experiment, where the injection was made by a small needle, seems to indicate that the larger opening may have predisposed to infection.

Summary

Because of the importance of allergy in the etiology of uveitis it was considered desirable to determine what histologic effect the ocular injection of histamine has upon the attraction of leukocytes. A review of the literature indicated that histamine is not chemotactic for leukocytes and this conclusion was confirmed for rabbit eyes.

Histamine acid phosphate was injected into the suprachoroidal space of the right eyes of 18 rabbits and a phosphate buffer control of the same pH into the suprachoroidal space of their left eyes. Microscopic study after periods ranging from 15 minutes to 3 days indicated no difference in the degree of cellular infiltration found.

It may be concluded that 0.055-percent histamine acid phosphate is not positively chemotactic for leukocytes and does not produce a uveal infiltration in rabbit eyes.

1040 West Michigan Street (7).

References

1. Wolf, E. P.: Experimental studies on inflammation: I. The influence of chemicals upon the chemotaxis of leukocytes in vitro. J. Exper. Med., **34**:375-396, 1921.

2. Bloom, W.: Histamine as an inflammatory agent. Bull. Johns Hopkins Hosp., **33**:185-187, 1922.

3. Wolf, E. P.: Experimental studies in inflammation: II. Experimental chemical inflammation in vivo. J. Exper. Med., **37**:523, 1923.

4. Grant, R. T., and Wood, J. E., Jr.: Histamine and leukocyte emigration. J. Path. & Bact., **31**: 1-7, 1928.

5. Findlay, G. M.: Histamine and infection, J. Path. & Bact., **31**:633-644, 1928.

6. Morgan, J. R. E.: The role of histamine in inflammation. Arch. Path., **18**:516-523, 1934.

7. Moon, V. H.: Mechanism of acute inflammation. Arch. Path., **20**:561-570, 1935.

8. Menkin, V.: Studies on inflammation. XII. Mechanism of increased capillary permeability: A critique of the histamine hypothesis. J. Exper. Med., **64**:485-502, 1936.

9. ———: Mechanism of inflammation. Arch. Path., **24**:65-82, 1937.

10. ———: Studies on inflammation. XV. Concerning the mechanism of cell migration. J. Exper. Med., **67**:145-158, 1938.

11. ———: Studies on inflammation. XIV. Isolation of the factor concerned with increased capillary permeability in injury. J. Exper. Med., **67**:129-144, 1938.

12. ———: The role of inflammation in immunity. Physiol. Rev., **18**:366-418, 1938.

13. ———, and Kadish, M. A.: Studies on the physiological effects of leukotaxine. Am. J. Physiol., 1938, v. 124, p. 524.

14. Rigdon, R. H.: Observations on the effect of histamine phosphate on capillary permeability and inflammation. J. Lab. & Clin. Med., **27**:1554-1562, 1942.

15. Schlaegel, T. F., Jr., and Davis, J. B.: The reaction of the rabbit eye to normal horse serum: Sensitization by intradermal injection. Am. J. Ophth., **26**:785-798, 1943.

16. Matsuda, A.: Concerning the action of histamine on the iris. Arch. f. exper. Path. u. Pharmakol., **142**:70-74, 1929.

17. Takabatake: Experimental investigation of the influence of histamine on the eye; first communication. Acta Soc. Ophth. Jap., **38**:50, 1934. Abstracted in Arch. Ophth., **13**:682, 1935.

18. Rycroft, B. W.: The relationship of histamine and the intra-ocular pressure. Brit. J. Ophth., **18**: 149-156, 1934.

19. Brückner, R.: Concerning the action of histamine on the eye. Ophthalmologica, **111**:306-309, 1946.

20. Alajma, B.: The action of histamine upon the normal and the glaucomatous eye. Rassegna Ital d. Ottal., **2**:3-31, 1933.

21. Friedenwald, J. S., and Pierce, H. F.: The pathogenesis of acute glaucoma: II. Experimental study. Arch. Ophth., **3**:574-582, 1930.

22. Darsie, M. L., Jr., Perry, S. M., Rosenfeld, D., and Zaro, J. A.: Size of histamine wheal in relation to dose and to animal species. Proc. Soc. Exper. Biol. & Med., **59**:278-281, 1945.

23. Cooke, R. A.: Allergy in Theory and Practice. Philadelphia, Saunders, 1947, p. 15.

RETINITIS PIGMENTOSA ASSOCIATED WITH GLAUCOMA*

SAMUEL GARTNER, M.D., AND ABRAHAM SCHLOSSMAN, M.D.
New York

The association of retinitis pigmentosa with glaucoma was observed by us in several clinical cases and pathologic specimens. This raised the question whether the two diseases were coincidental or whether they bore a relationship to each other. The literature on the subject was found to be meager, but indicated that others have also felt that glaucoma was in some way related to retinitis pigmentosa. The migration of pigment is an outstanding characteristic of retinitis pigmentosa. Since the presence of pigment in the angle of the anterior chamber has been stressed as a possible etiologic factor in glaucoma, it was hoped that a careful study of these cases would shed some light upon this problem.

Retinitis pigmentosa is an important disease for it causes blindness sooner or later to all who suffer from it. When combined with glaucoma, this blindness occurs sooner. Our knowledge of retinitis pigmentosa is very limited, and our therapeutic results are very close to zero despite many attempts, including the recent suggestions of the Russians for the use of tissue extracts.

Retinitis pigmentosa has many peculiarities. It usually appears as an hereditary and familial disease with several different forms of heredity which will be discussed later in this article. It may be the only disease in otherwise healthy people. It may be associated with other ocular disorders, such as myopia or macular hole.[1]

Retinitis pigmentosa is frequently associated with other systemic disorders, particularly deaf-mutism, and occasionally with defects of the central nervous system, mental retardation, and idiocy. The Laurence-Moon-Biedl syndrome is an atypical retinitis pigmentosa with mental retardation, polydactyly, and pituitary disorders, such as obesity, and hypogenitalism.

LITERATURE

In 1862, Galezowski[2] described the first case of retinitis pigmentosa associated with glaucoma. Schnabel,[3] in 1878, published a case of acute glaucoma in a patient with retinitis pigmentosa and described the pathologic findings in the enucleated eye. The literature on the subject and 38 cases of glaucoma associated with retinitis pigmentosa were studied, and are outlined in Table 1. A large number of the cases were reported by the Russians who seem to have been particularly interested in retinitis pigmentosa. Among the papers which give a good review of the subject are those by Schmidhauser,[16] Mueller,[20] and Kotliarevsky.[27] Leber[29] and Peters[30] have written short reviews. Julia Bell[31] in her monograph on inheritance in retinitis pigmentosa has collected from the literature seven pedigrees showing an association with glaucoma.

Of the cases reported, 15 were apparently chronic simple, 7 inflammatory, 5 acute, and 3 absolute glaucoma. Two more cases were probably chronic simple glaucoma, and in 6 instances it was not possible to determine the type. Some of the cases of retinitis pigmentosa were atypical. Since many of the cases were described before the advent of the Schiøtz tonometer, it is difficult to know whether some of those reported really suffered from glaucoma. Optic atrophy in eyes with deep cupping may resemble glaucomatous excavation.

On the other hand, it is well known that the ophthalmoscopic picture of retinitis pigmentosa may be simulated by other conditions, such as, syphilitic and other forms of chorioretinitis, and trauma. The increased

* This work was done at Montefiore Hospital under the William L. Hernstadt Fund. Read in part at the meeting of the Section on Ophthalmology, New York Academy of Medicine, February 21, 1949.

TABLE 1

CASES REPORTED IN LITERATURE AS SHOWING RETINITIS PIGMENTOSA WITH GLAUCOMA

No.	Author	Year	Apparent Type of Glaucoma	Apparent Age at Onset	Sex	Hereditary
1.	Galezowski[3]	1862	R. & L., acute	60	M	
2.	Schnabel[3]	1878	L., acute	54	M	
3.	Mandelstamm[4]	1891	R. & L., simple	56	M	
4.	Mandelstamm	1891	?	?	?	
5.	Bellarminoff[5]	1893	R. & L., chronic	40	M	55-year-old sister blind, cousin blind
6.	Heinersdorff[6]	1897	Simple	22	M	Sister ret. pig.
7.	Goldzieher[7]	1897	Simple	30	F	4 sibs nyctalopia. 1 brother ret. pig.
8.	Natanson[8]		Simple	35	M	
9.	Natanson		L., simple	55	F	
10.	Strachow[9]	1901				
11.	Strachow	1901				
12.	Filatov[10]	1902	Simple	40	M	
13.	Komarowitsch[11]	1903	L., acute	46	M	
14.	Maslenikoff[12]	1903	Chronic	17	F	
15.	Weiss[13]	1903	L., simple	48	F	Brother ret. pig.
16.	Wider[14]	1885	R. & L., simple	25	F	
17.	Wider	1885	R. & L., chronic inflammatory	48	F	All sibs except brother ret. pig.
18.	Herrlinger[15]	1904	R., chronic inflammatory, L., absolute	42	M	Consanguinity
19.	Schmidhauser[16]	1904	R. & L., inflammatory	57	M	Brother is Case 17
20.	Schmidhauser	1904	L., inflammatory	63	M	
21.	Carbone[17]	1904	R. & L., chronic inflammatory	54	M	Father probably syphilitic
22.	Isupow[18]	1910	R. & L., chronic inflammatory	38	M	
23.	Weinstein[19]	1911	L., simple	35	M	Brother nyctalopia
24.	Mueller[20]	1916	L., simple	53	M	
25.	Mueller	1916	R. & L., simple	48	F	Grandmother blind at age of 40 yrs.
26.	Henderson[21]	1903	R., absolute	72	F	
27.	Henderson	1903	L., absolute	21	M	
28.	Baumgarten[22]	1916	R., simple	34	M	
29.	Bradbourne[23]	1916	?	51	F	5 out of 6 sisters had ret. pig.
30.	Bradbourne	1916	L., acute	50	F	Cases 29, 30, and 31 had ret.
31.	Bradbourne	1916	L., simple	49	F	pig. and glau. Mother blind
32.	Ayres[24]	1886	Acute		M	Grandmother blind 2 sisters ret. pig.
33.	Ayres	1886			F	1 brother ret. pig., 1 brother ret. pig. and glaucoma
34.	Vegodsky[25]	?	?			
35.	Tobalovsky[26]	?	?			
36.	Kotliarevsky[27]	1931	R. ? L., simple	38		
37.	Kotliarevsky	1931	R., inflammatory	48	M	
38.	Attiah[28]	1941	Simple	28	M	

tension in some cases in the literature may have been secondary to other ocular diseases. Since most of the reports were made before tonometry was in general use, the individual cases in the literature are not discussed, but are only outlined in Table 1. Conclusions will be drawn from the more recent cases and those described in this paper.

CASE REPORTS

Eight cases were collected and three of them were examined histologically.

CASE 1

History. J. C., a man, aged 30 years, was a patient in Dr. Boyes's service at the New York Eye & Ear Infirmary and is reported

through his kind permission. Retinitis pigmentosa was diagnosed at the age of 14 years. He developed glaucoma at 20 years of age, and surgery was performed at another hospital for this condition.

Eye examination. Vision was light perception in both eyes with fair projection. The right pupil was large, the lens opaque, and the iris tremulous indicating a dislocated lens. The left pupil was small and distorted. There was some lens opacity. The fundi were not visualized at this time. The tension in the right eye was 50 mm. Hg (Schiøtz) and in the left, 20 mm. Hg. The dislocated lens was removed from the right eye, but the tension remained elevated. Prostigmin and mecholyl controlled the tension and, since that time, it has been maintained with pilocarpine.

Family history. The patient's parents were first cousins. Two brothers have retinitis pigmentosa but no glaucoma. Three other brothers are normal. The patient posed the question whether he should have any children. We do not have sufficient data to know whether the inheritance is autosomal recessive or sex-linked recessive. If his maternal grandfather had suffered from retinitis pigmentosa, the disease probably would be sex-linked. Since his father and mother were first cousins, it is possible that the condition is an autosomal recessive. At all events, the only safe course was to advise him against having children.

CASE 2

History. N. K., a man, aged 41 years, a patient at Montefiore Hospital, had suffered from night blindness since childhood. A diagnosis of retinitis pigmentosa was made in 1941 when he was 33 years old. He developed tuberculosis in 1944. In 1945, while at Montefiore, bilateral glaucoma was diagnosed.

Eye condition. At that time, the intraocular tension was 48 mm. Hg (Schiøtz) in the right eye, and 45 mm. Hg in the left. Vision was : R.E., 15/20; L.E., 15/25. The visual fields were constricted. The retina in both eyes showed typical bone corpuscle pigment accumulations, narrow blood vessels, and atrophy of the optic nerve.

Since miotics did not control the tension, bilateral iridencleises were performed. Following surgery, the anterior chambers remained very shallow. Both irides were vascularized and patches of iris atrophy were visible. The pupils were drawn up and a small filtering bleb was present in each eye. The tension was 25 mm. Hg in both eyes. Corrected vision was : R.E., 15/100; L.E., 15/70. He uses pilocarpine (2 percent) three times a day.

CASE 3

This case is presented through the courtesy of Dr. Charles A. Perera.* The patient was originally one of Dr. Charles H. May's and was subsequently treated by Dr. Perera.

History. F. T., a woman, aged 36 years, gave a history of night blindness and poor vision for many years. Since early childhood, she suffered from a marked strabismus, which was corrected in 1933 with an excellent cosmetic result.

Eye examination in May, 1936, showed normal intraocular pressure and shallow anterior chambers. The fundi revealed marked narrowing of the vessels, pallor and blurring of the discs. The peripheral retina contained small irregular pigment deposits and small pigmented areas were scattered throughout the fundi. The visual fields of each eye were contracted concentrically to 15 degrees from fixation. Vision in the right eye was corrected to 15/30 with +3.OD. sph. ⌒ +1.25D. cyl. ax. 105°, and the left eye to 15/25 with +3.0D. sph. ⌒ +0.75D. cyl. ax. 85°

The patient returned one month later, in June, and stated that five days previously she had experienced blurring of vision lasting five hours. There was no evidence, how-

* This case was presented at the meeting of the Section of Ophthalmology, New York Academy of Medicine, May 16, 1943, by Dr. Perera.

ever, of recent ocular disturbance. Four months later, in October, 1936, she returned with an acute iridocyclitis in the left eye which became quiescent after four weeks of atropine and salicylate therapy. Her intraocular pressure was normal at this time.

In November, 1937, the patient suffered an acute attack of glaucoma in the left eye which became stony hard. Tension was reduced to nearly normal by repeated instillations of eserine and pilocarpine. Two days later, the tension in both eyes rose to over 85 mm. Hg. Miotics did not help, and a bilateral Lagrange operation reduced her tension to normal.

The patient was last seen in February, 1948, at which time the intraocular pressure was 18 mm. Hg in the right eye, and 25 mm. Hg in the left. Her visual fields have not contracted further during the last 10 years. Her corrected vision is: R. E., 20/40; L.E., 20/30. The reduction in visual acuity was probably due to some increase in the posterior central lenticular opacities.

CASE 4

This case and Case 5 were briefly included in a previous report[32] and are from the practice of Dr. Adolph Posner.

History. The patient, W. F., a man, aged 53 years, gave a history of night blindness and retinitis pigmentosa was diagnosed in 1936. At that time, his intraocular pressure was normal.

Following a head injury in January, 1940, he was unconscious for 5 or 10 minutes. After that, he began to see halos around lights and experienced foggy vision after reading. He was seen by Dr. Posner in January, 1940. The tension was 42 mm. Hg (Schiøtz) in the right eye, and 49 mm. Hg in the left eye.

Eye examination. Vision of the right eye was 20/20 with a −0.75D. sph. ⌒ +1.5D. cyl. ax. 180°, and 20/20 in the left eye with +0.25D. sph. ⌒ +0.5D. cyl. ax. 90°.

There was shallow cupping of both optic discs, which showed a yellowish tinge. The blood vessels were approximately normal in caliber and, in the periphery of the fundus, there were pigment deposits of the bone corpuscle type. The fields showed ring scotomas.

The tension responded temporarily to pilocarpine, but two weeks after the institution of medication, an acute attack of glaucoma occurred in the right eye. Iridencleisis was performed on one eye in January, 1940, and on the other in February, 1940, and the tension became normal. In 1946, when the patient was last seen, the tension in the right eye was 15 mm. Hg and in the left eye 20 mm. Hg. The visual fields were further contracted.

CASE 5

History. N. F., a white woman, aged 38 years, was seen in 1940 with a history of retinitis pigmentosa of 20 years' duration. She had married in 1940 and two months after marriage she had a sense of heaviness over the right eye and blurring of both eyes. Within a week, she lost all vision in the right eye.

Eye examination. When she was seen in August, 1940, vision of the right eye was nil and with the left eye she counted fingers at 12 inches. The right eye showed conjunctival congestion, edema of the cornea, and a tension of 90 mm. Hg (Schiøtz). The left eye had a tension of 50 mm. Hg and was somewhat congested. There was bilateral horizontal nystagmus. The discs were yellow and the vessels narrow. There were some irregular pigmented areas in the periphery of the fundus.

Family history. Two of her sisters suffer from retinitis pigmentosa and one of them, three years older than the patient, also has glaucoma in the left eye. One brother and sister are normal. Her parents are normal.

We are indebted to Brig. Gen. R. O. Dart and Mrs. H. C. Wilder of the Army Medical Museum for Cases 6, 7, and 8, and these cases are presented with the kind permission of the donors of these specimens.

CASE 6

History. The patient (Accession 81319—contributed by Dr. E. C. Ellett) was a 26-year-old white woman. Both she and her sister had retinitis pigmentosa. Hyperopia was found at the age of six years. Since then, her vision had become progressively worse until now, at her 26th year, she had developed severe pain in her left eye following dilatation of her pupils. The tension in the eye was 50 mm. Hg (Schiøtz), and an iridectomy was performed. Three years later, the anterior chamber filled with blood following a bout of sneezing. Elevated tension returned with severe pain, and it was necessary to enucleate the eye.

Pathologic Examination

Gross. The specimen consists of a small eye measuring 20 by 20 by 19 mm. The cornea is cloudy. There is irregular pigmentation of the fundus. The lens is opaque, the optic disc is cupped, and the anterior chamber is filled with blood-stained exudate.

Microscopic (figs. 1 and 2). The scar of iridectomy does not appear in the sections examined. There is little edema of the basal layer of the corneal epithelium. The anterior and posterior chambers contain blood. There are peripheral anterior synechias. The iris is atrophic and there are hyalinization and vascularization of the pupillary zone. The ciliary body is also atrophic.

There is considerable irregularity of the pigment epithelium which is depigmented in some areas, while in other regions it is deeply pigmented. Large clumps of pigment appear in the retina. Retinal vessels show obliterating changes and perivascular deposits of pigment. The rods and cones have almost completely disappeared. There is a loss of the normal architecture with replacement by glial tissue. The hole in the nervehead apparently was the site of calcified drusen which were lost during the technical procedures. One section shows small basophilic-staining drusen at the edge of the hole. The lamina cribrosa is depressed.

Diagnosis. Retinitis pigmentosa, glaucoma, drusen in nervehead, and recent hemorrhage in anterior chamber.

CASE 7

History. G. I. (Accession 72718—contributed by Dr. William M. Scales), a woman, aged 57 years, was seen in 1934 and a diagnosis of bilateral retinitis pigmentosa was made. The patient was not seen again until two weeks prior to enucleation when she complained of suffering for the past 6 months with pain which was apparently due to glaucoma in her left eye.

Eye examination. There was moderate pericorneal injection and the cornea showed degeneration with the formation of bullae. Transillumination was unsatisfactory. There was a brown cataract through which no reflex was obtained. Tension in the left eye was 70 mm. Hg (Schiøtz) while that in the right eye was 24 mm. Hg. The anterior segment of the right eye was normal except for a generalized opacity of the lens. Since the left eye was painful and did not have any light perception, it was enucleated.

In June, 1946, after a right cataract extraction, the vision corrected to 20/40 and there was ophthalmoscopic evidence of retinitis pigmentosa. There was no family history of night blindness or poor vision.

Pathologic Examination

Gross. Firm eye measuring 24 by 23 by 22 mm. The clouded cornea has a peripheral zone of opacity. The anterior chamber is shallow and the lens cataractous. Posterior to the equator, the fundus is deeply pigmented. The optic disc is cupped.

Microscopic (fig. 3). There are peripheral anterior synechias. The iris and ciliary body are atrophic and the ciliary processes are flattened and hyalinized. The entire uveal tract is rather deeply pigmented. There are multiple chorioretinal adhesions where Bruch's membrane has disappeared. The retina is atrophied and gliosed, with loss of rods and cones.

Fig. 1 (Gartner and Schlossman). *Case 6.* This shows peripheral anterior synechias and the absence of pigment in the angle.

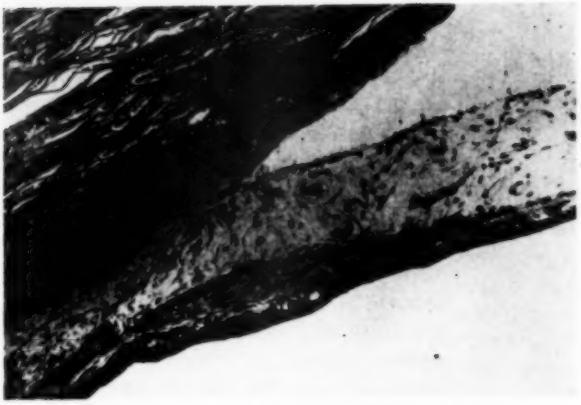


Fig. 2 (Gartner and Schlossman). *Case 6.* This figure also shows peripheral anterior synechias and the absence of pigment in the angle.

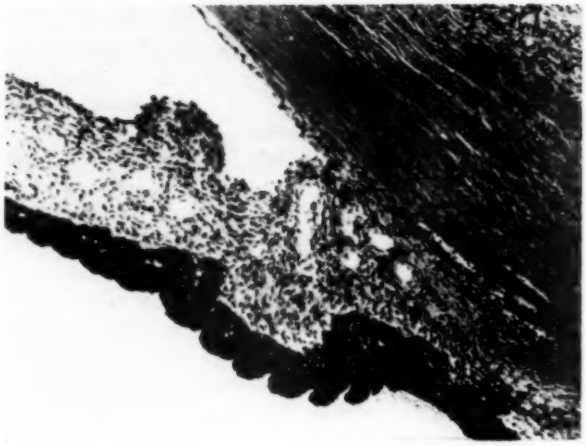


Fig. 3 (Gartner and Schlossman). *Case 7.* There are peripheral anterior synechias but no pigment in the angle.

There is hyalinization, occlusion, and perivascular pigmentation of retinal vessels. Masses of pigment are present in the retina, and there are numerous areas in which the pigment epithelium is flattened and depigmented, or has disappeared entirely.

It is only in the macular region that any of the normal architecture is retained and here there is marked loss of ganglion cells. The optic disc is deeply excavated and the lamina cribrosa is correspondingly depressed. There is an atrophy of the optic nerve and lymphocytic infiltration around the central vein. Embedded in paraffin and cut separately, the lens shows cataractous changes.

Diagnosis. Retinitis pigmentosa, glaucoma, cataract, and optic atrophy.

CASE 8

M. B. (Accession 78871—contributed by Dr. C. A. Veasey, Sr.), a woman, aged 41 years, was known to have retinitis pigmentosa since her early twenties. In December, 1941, she was blind in the right eye and the left eye had a field which contracted to within 10 degrees of fixation. The right eye had previously had iritis with a large synechia at the 4-o'clock position. The pupil was irregularly dilated. There was absolute glaucoma. Tension in the right eye was 95 mm. Hg (Schiøtz), and in the left eye it was 17.5 mm. Hg. The left eye showed marked retinitis pigmentosa. Her father is alive and also suffers from retinitis pigmentosa.

Pathologic Examination

Gross. Firm eye measuring 24 by 23 by 23 mm. There is some peeling of the corneal epithelium. The pupil is dilated and eccentric.

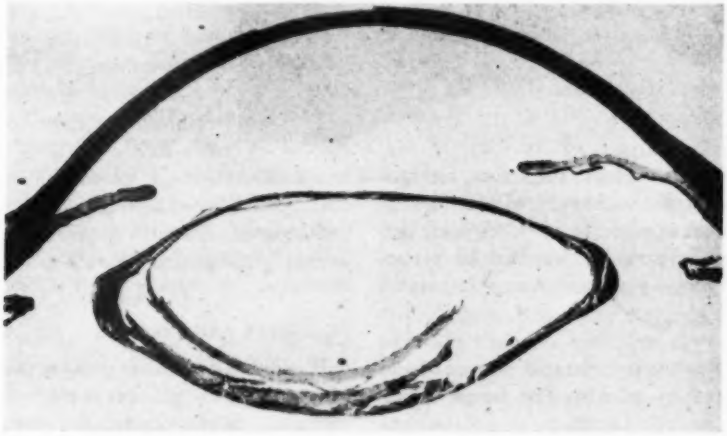


Fig. 4 (Gartner and Schlossman). *Case 8.* This demonstrates the presence of anterior synechias, ectropion uveae, and iris cysts.

There are numerous minute pigmented spots in the retina. The lens is opaque and the vitreous cloudy.

Microscopic. There are peripheral anterior synechias, vascularization of the anterior surface of the iris, and ectropion uveae (figs. 4, 5, and 6). The pigment epithelium is separated and serous exudate fills the resultant cystlike spaces. There are degenerative changes in the cortical fibers of the lens. The ciliary body is atrophic. The iris and ciliary body are sparsely infiltered by chronic inflammatory cells. Lymphocytes more densely infiltrate the choroid. Occasional drusen are seen on Bruch's membrane.

The retinal pigment epithelium is markedly flattened and in many areas it is depigmented.

Fig. 5 (Gartner and Schlossman). *Case 8.* High-power view of the section in Figure 4, showing the angle with peripheral anterior synechias and a small amount of pigment in the angle. The pigment epithelium of the iris shows cyst formation.

Between the choroid and the retina, foreign-body giant cells surround cholesterin slits which remain as evidence of old hemorrhage. The retina is partially detached by serous exudate and pigment-laden phagocytes beneath it.

Retinal rods and cones and their nuclei in the outer nuclear layer have disappeared and are replaced by gliosis. The inner retinal layers show considerable loss of normal architecture, microcystic degeneration, and gliosis. Particularly in the peripheral portion of the retina, there are obliterative changes in the blood vessels with perivascular pigmentation.

The optic disc and lamina cribrosa are depressed. There is a little organizing inflammatory and hemorrhagic exudate in the vitreous chamber at the ora serrata.

Diagnosis. Retinitis pigmentosa, chronic uveitis, glaucoma, and cataract.

Discussion

Incidence and type

It is difficult to obtain data on the incidence of glaucoma in patients with retinitis pigmentosa. Many cases of symptom-free

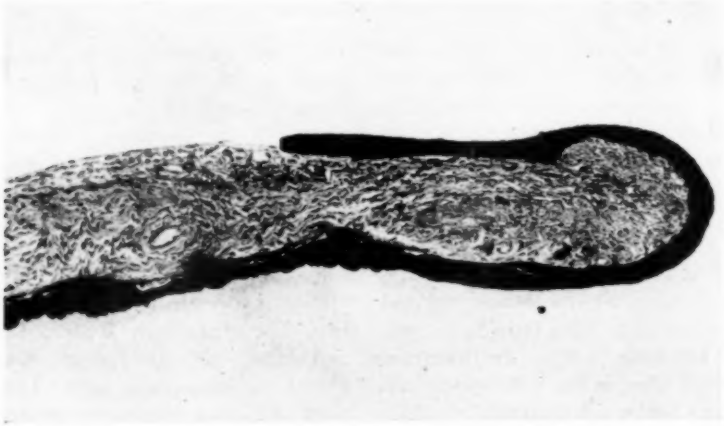


Fig. 6 (Gartner and Schlossman). *Case. 8.* High-power view of the section in Figure 4, showing ectropion uveae. There is a delicate, newly formed membrane on the anterior surface of the iris.

chronic glaucoma are probably missed, particularly when the eye is blind. Seven out of the 8 patients reported in this paper suffered from congestive glaucoma and the eighth probably had congestive glaucoma.

Weiss[13] reported 1 case of glaucoma among 55 patients with retinitis pigmentosa. Schmidhauser[16] reported 5 cases of glaucoma among 180 patients with retinitis pigmentosa at the Tuebingen clinic, a percentage of 2.78 as compared with 0.73 percent for all glaucoma in the clinic. In the private practices of Dr. Mark J. Schoenberg and Dr. Adolph Posner, glaucoma was diagnosed in 3 percent of all cases. Two patients out of 20 with retinitis pigmentosa, or 10 percent, suffered with glaucoma. However, with such small numbers, it is better to avoid conclusions. Suffice it to say that it is the opinion of most authors, including Leber[29] and Verhoeff,[33] that the occurrence of the two diseases together is more frequent than one would expect if it were based on coincidence alone.

It is generally believed that the glaucoma is secondary to the retinitis pigmentosa. Still, glaucoma occurs in relatively few cases. The ocular hypertension occurs in cases which clinically appear no different from other cases of retinitis pigmentosa. The glaucoma is similar to the usual case of primary glaucoma. In Case 1, the increased tension may have been due to the dislocated lens but, 10 years previously, the patient had suffered from glaucoma which required surgery. It is interesting to note that, in Cases 3 and 8, there was an attack of iridocyclitis before the glaucoma was evident.

The action on the eye of toxic substances which accumulate from the degeneration of the retina and the pigment epithelium may be a factor in the development of the glaucoma. A toxic action on the meshwork of the angle may impair its function.

We really do not know how much of the drainage of the intraocular fluids takes place through the retinal and choroidal vessels. Sclerosis of these vessels is commonly found in glaucoma of all types. It is difficult to determine whether this is a cause or effect; or whether it compounds the damage.

Pathology

In the literature, we have been able to find only three reports of pathologic studies of eyes with retinitis pigmentosa and glaucoma. These are by Schnabel, Komarowitsch, and Henderson.[5, 11, 21] Komarowitsch reported that the posterior lens surface was covered by a glass membrane thicker than the lens capsule. It was grown to the iris as in "glaucoma and iridochoroiditis."

The pathologic findings in the three cases presented here are similar to those found in glaucoma and in retinitis pigmentosa. There was atrophy of the iris and ciliary body. Peripheral anterior synechias were always present. The lamina cribrosa had receded and and the optic discs were excavated.

In addition, there were areas of depigmentation and degeneration of pigment epithelium and in many areas of the retina, especially around the vessels, there were large pigment deposits (figs. 7 and 8).

There was a loss of the normal retinal architecture; the rods and cones had largely disappeared and were replaced by glial tissue. The other retinal layers were diminished in their cellular content, irregular in their arrangement, with glial proliferation throughout the retina. The macular retina was best preserved, and formed a striking contrast to the remainder. Pigment deposits were found in the retina in characteristic bone corpuscle shapes and surrounding the blood vessels.

Von Hippel[34] described two enucleated eyes with glaucoma and retinal findings similar to retinitis pigmentosa. However, many pathologic conditions of the retina and choroid simulate retinitis pigmentosa. Chorioretinitis, particularly the luetic type, and trauma, particularly with an intraocular foreign body, are among the more common offenders. Careful perusal of the histories in Von Hippel's cases makes one rather dubious

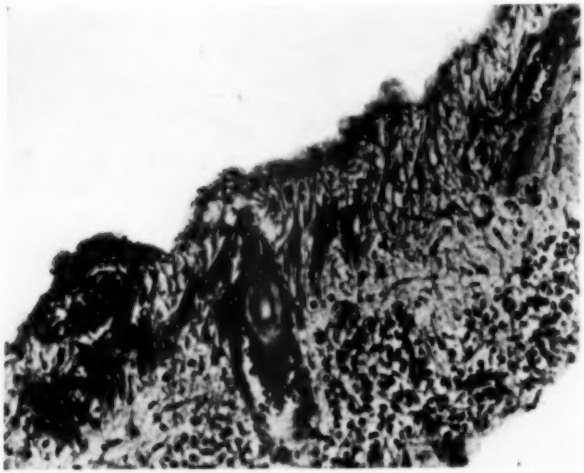


Fig. 7 (Gartner and Schlossman). Oblique section of the retina in a case of retinitis pigmentosa, showing the pigment deposits mainly above the vessels and a few irregular clumps of pigment.

whether they are true cases of retinitis pigmentosa.

He proposed the hypothesis that pigment accumulation in the angle was the cause of the glaucoma. As proof, he showed a picture of the chamber angle in one case with a considerable amount of pigment. Consequently, the belief has taken hold that the ocular hypertension in retinitis pigmentosa is caused by an accumulation of pigment in the trabeculum, mechanically blocking filtration.

The angles of the anterior chamber in the cases presented in this study were carefully examined (figs. 1, 2, 3, and 5). While pigment was present, the amount was not excessive nor even considerable. In one case, there was hardly any pigment at all in the trabecular spaces.

A survey was made of the anterior-chamber angles in a large number of slides from a variety of other cases. Pigment in the angle was found to increase with age and was present in larger amounts at the lower part of the angle. The normal Negro eye has considerable pigment in the trabeculum. Small amounts of pigment are common in glaucoma.

Malignant melanoma of the choroid with secondary glaucoma shows little or no pigment in the angle in most cases. We found only one case of glaucoma secondary to melanoma of the iris with a very heavy deposit of pigment in the trabecular spaces. The angle of the anterior chamber is open and there are no posterior synechias (fig 9).

Only in this particular case does it seem possible that pigment in the trabeculum may have been a factor in producing glaucoma. Even in this instance, we cannot be certain

Fig. 8 (Gartner and Schlossman). Flat section of the retina in a case of retinitis pigmentosa, showing the pigment deposits mainly above the blood vessels with some irregular clumps of pigment.

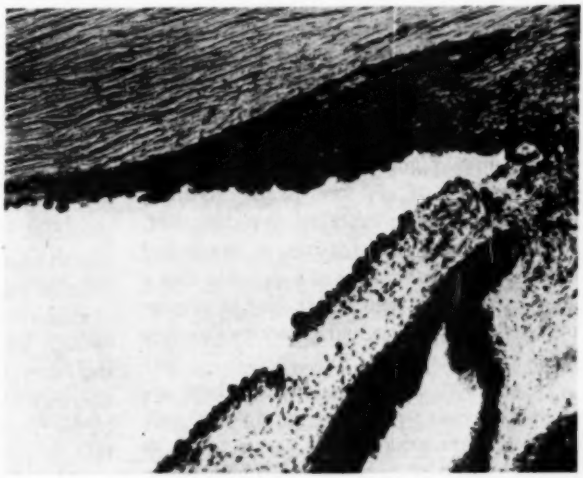


Fig. 9 (Gartner and Schlossman). Case of melanoma of the iris with glaucoma, showing an extensive deposit of pigment in the trabeculum without peripheral anterior synechias.

that some other mechanism, which produces glaucoma in the usual case of melanoma, was not operative in this one.

Gonioscopic studies in several of our cases of retinitis pigmentosa did not show any abnormal amount of pigment in the trabecular spaces. We believe that in the cases of retinitis pigmentosa and glaucoma, it is not a simple mechanical block of the angle by pigment which produces the glaucoma. It is possible that the dispersed pigment and the products from retinal degeneration are toxic to the trabeculum, alter its permeability, and thus produce glaucoma.

One finding is common to both retinitis pigmentosa and glaucoma; namely, sclerosis of the retinal vessels. While this condition may not exist in early cases of glaucoma, it is usually prominent by the time the eyes become pathologic specimens. Its influence on the course and development of both diseases is not clear.

The narrowing of the retinal vessels in retinitis pigmentosa was noted long ago and it was assumed by some that the retina became degenerated due to a spasm of the vessels causing a poor blood supply. Attempts have been made to widen these vessels by sympathectomy. That this type of approach was doomed to failure can be readily understood when these eyes are examined histologically. The vessels are narrow due to extensive sclerosis with endothelial proliferation and dense connective-tissue formation which usually has undergone hyalin degeneration. In these vessel walls, no muscle can be identified. Such a wall cannot conceivably be affected by sympathectomy. Only if there were a muscular spasm narrowing the vessels could sympathectomy possibly widen them.

The impaired circulation in retinitis pigmentosa is apparently a result of the disease affecting the vessels. The perivascular accumulation of pigment may be a factor in causing the sclerosis. Early stages of retinitis pigmentosa are frequently seen in young people who have a rich retinal circulation. Among the aged, we see large numbers who develop narrow retinal vessels due to extensive arteriosclerosis without ever developing the picture of retinitis pigmentosa. Therefore, it does not appear likely that the arteriosclerotic process causes the retinitis pigmentosa. The reverse seems more probable.

A study of a disease in rats which resembles retinitis pigmentosa was reported by Bourne, Campbell, and Tansley.[35] They found that it was inherited as a recessive Mendelian character. Retinal degeneration began in the rods, then proceeded to the outer nuclear layer. Later, the pigment epithelium became degenerated apparently as a secondary effect. The subsequent wandering of the pigment into the retina gave the characteristic picture. These authors agree with Treacher Collins[36] that there is an abiotrophy of the retinal epithelium, and also with Ver-

hoeff[32] that it is not the choroidal changes which produce this disease.

Heredity

The pedigrees which have been collected from the literature by Bell[31] demonstrate that retinitis pigmentosa may be inherited in a number of different ways. Retinitis pigmentosa may be inherited as a dominant, partially dominant, recessive, or sex-linked recessive character. It is also possible that a gene for retinitis pigmentosa may be present in the y-chromosome and even cross over to the x-chromosome.[37]

In addition, it is possible that there are several recessive forms of the disease, each with separate genes. Thus, even from an heredity point of view, retinitis pigmentosa seems to represent several diseases. Primary glaucoma is hereditary in approximately 13 percent of the cases. Posner and Schlossman[38] recently reported a series of pedigrees of glaucoma families showing that, although the disease is dominant, there is a certain amount of lack of penetrance; also the possibility of recessive inheritance was not excluded.

Similar to its combination with deafness and myopia, the cases of retinitis pigmentosa and glaucoma may be inherited together as coincidental or associated defects. It is possible that the genes for these separate diseases are linked on the same chromosome. Glaucoma and retinitis pigmentosa may be a single hereditary syndrome similar to the Laurence-Moon-Biedl syndrome.

Of the seven reported pedigrees of retinitis pigmentosa and glaucoma, only two show glaucoma in more than one sibling. Blessig,[39] on the other hand, reported an interesting family tree which suggests that the occurrence of the combinations of both diseases is more than mere coincidence. Among 9 children, 2 sisters suffered from glaucoma and did not have retinitis pigmentosa, while 2 brothers and 1 sister suffered from retinitis pigmentosa without glaucoma. One of the siblings with glaucoma and all of those with retinitis pigmentosa suffered from deafness. Bradbourne's[23] pedigree shows 5 sisters out of 9 siblings with retinitis pigmentosa. Three of them also had glaucoma.

Among the cases presented in this paper, Case 1 has 2 brothers with retinitis pigmentosa; Case 5 has 2 sisters with retinitis pigmentosa and 1 of them also suffered with glaucoma. Case 6 has a sister with retinitis pigmentosa, and the father of Case 8 had retinitis pigmentosa.

Unfortunately, we were not able to obtain enough data on any of our cases to determine the exact nature of the inheritance. The occurrence of only one disease in one member of the family and two diseases in other members is an interesting phenomenon. This is similar to the occurrence of arachnodactyly in some members of a family, dislocated lenses in other members, and a complete Marfan's syndrome in still other siblings.

Case 1 was concerned about having children. From the meager pedigree that is available on this patient, it is difficult to know whether the heredity is sex-linked recessive or autosomal recessive with the development of the disease as the result of the consanguineous marriage of his parents. We need to know whether his maternal grandfather had suffered with retinitis pigmentosa to decide whether the inheritance was sex-linked. Unfortunately, this information was not available. We advised him against having any children because of the possibility that the condition was sex-linked. It is important to know the mechanisms of heredity because patients are well aware of the hereditary nature of disease and the physician has the responsibility of giving eugenic information and advice.

Endocrine

The pituitary gland has been implicated in retinitis pigmentosa, especially in the Laurence-Moon-Biedl syndrome. Some cases have pigmentary changes elsewhere in the body. Zondek and Wolfsohn[40] have stressed symptoms of pituitary involvement in some

cases of glaucoma. It is well known that the autonomic nervous system plays a role in the pathogenesis of glaucoma. Some think there is a relation between the vegetative nervous system and retinitis pigmentosa. These considerations, however, are so speculative that they are mentioned without discussion.

Undoubtedly, many cases of glaucoma remain undiagnosed in patients who are blind from retinitis pigmentosa. All cases of retinitis pigmentosa should be studied for early signs of glaucoma.

The appearance of retinitis pigmentosa is probably produced by a number of disease processes. The heredity and the course of the disease varies a great deal in different families. It is possible that the retinitis pigmentosa associated with glaucoma is different from the other forms of retinitis pigmentosa.

Summary

Eight cases of retinitis pigmentosa associated with glaucoma are presented and the pathologic findings in three of these cases are described. Accumulation of pigment in the trabecular spaces with blockage of the filtration channels was not a factor in the development of glaucoma in these cases.

The possible etiologic connections between the two diseases are discussed. The role of toxic substances from the degeneration of the retina and pigment epithelium and sclerosis of the vessels is considered.

From an hereditary point of view, it is possible that the two diseases are linked together on the same chromosome and form a single hereditary syndrome.

521 Park Avenue (21)

667 Madison Avenue (21).

References

1. Perera, C. A.: Retinitis pigmentosa with hole in macula. Arch. Ophth., **20**:471, 1938.
2. Galezowski, X.: Acute glaucoma in a case of progressive atrophy of the retina. Ann. d'ocul., **48**: 269, 1862.
3. Schnabel, I.: Contributions to the study of glaucoma. Arch. f. Augenh., **7**: 128, 1878.
4. Mandelstamm, M. E.: In Schmidhauser, K. F.: Retinitis pigmentosa and glaucoma. Tuebingen, 1904.
5. Bellarminoff, L. G.: A rare case of retinitis pigmentosa complicated by glaucoma. Arch. f. Augenh., **27**:53, 1893.
6. Heinersdorff. A case of bilateral noncongestive glaucoma in early youth associated with retinitis pigmentosa and myopia. Arch. f. Augenh., **34**:230, 1897.
7. Goldzieher, W. A.: A case of retinitis pigmentosa with glaucoma. Centralbl. f. prak. Augenh., **21**:116, 1897.
8. Natanson, A.: In Schmidhauser, K. F.: Retinitis pigmentosa and glaucoma. Tuebingen, 1904.
9. Strachow: Ophth. Klin., 9, 1901.
10. Filatov, V. P.: Glaucoma in combination with retinitis pigmentosa. Vestnik. oftal., **20**:108, 1903.
11. Komarowitsch: A case of retinitis pigmentosa with glaucoma. Russ. Medizin., Rundschau, 1902-03, p. 257.
12. Masllenikoff, A. I.: Glaucoma in retinitis pigmentosa. Vestnik. oftal., **20**:98, 1903.
13. Weiss, E.: Retinitis pigmentosa and glaucoma. Sammlung. Zwanglos. Abhand. aus dem Geb. der Augenh., v. 5, no. 5, Halle, 1903.
14. Wider: On the etiology of retinitis pigmentosa. Inaug. Dissert., Tuebingen, 1904.
15. Herrlinger: In Schmidhauser, K. F.: Retinitis pigmentosa. Tuebingen, 1904.
16. Schmidhauser, K. F.: Retinitis pigmentosa and glaucoma. Tuebingen, 1904.
17. Carbone, A.: A case of glaucoma associated with retinitis pigmentosa. Clin. ocul. (Palermo) 1872-7, 1904.
18. Isupow, M. A.: Retinitis pigmentosa complicated by glaucoma. Vestnik. oftal., **12**:207, 1910.
19. Weinstein: Retinitis pigmentosa and glaucoma. Vestnik. oftal. **13**:149, 1911.
20. Mueller, F.: Retinitis pigmentosa and glaucoma. Inaugural Dissert., Giessen, 1916.
21. Henderson: Two cases of pigmentation of the retina. Ophth. Hosp. Reports, **25**:355 (Part 4), 1903.
22. Baumgarten: In Mueller, F.: Retinitis pigmentosa and glaucoma. Giessen, 1916.
23. Bradbourne, A. A.: Retinitis pigmentosa in 5 sisters with glaucoma. Ophth. Rev. **35**:64, 1916.
24. Ayres, S. C.: Retinitis pigmentosa. Amer. J. Ophth., **3**:81, 1886.
25. Vegodsky: In Kotliarevsky: Russ. Arch. Ophth., **8**:159, 1931.
26. Tobalovsky: In Kotliarevsky: Russ. Arch. Ophth., **8**:159, 1931.

27. Kotliarevsky, C. B.: Concerning the connection of retinitis pigmentosa with glaucoma. Russ. Arch. Ophth., **8**:159 (Part 1-2), 1931.
28. Attiah, M. A. H.: Juvenile glaucoma and retinitis pigmentosa. Bull. Ophth. Soc. Egypt, **34**:21, 1941.
29. Leber, T. H.: Die Krankheiten der Netzhaut. Handbuch. der Augenh., Auflage, VII. Band, 1916, p. 1137.
30. Peters, A.: Glaucoma. Handbuch. der Augenh., 3ª Auflage, 1930, p. 105.
31. Bell, J.: Retinitis pigmentosa and allied diseases. In Anomalies and Diseases of the Eye. Treasury of Human Inheritance, University of London, 1932, v. 2, p. 19, 91.
32. Posner, A., and Schlossman, A.: The clinical course of glaucoma. Am. J. Ophth., **31**:915, (Aug.), 1948.
33. Verhoeff, F. H.: Microscopic observations in a case of retinitis pigmentosa. Arch. Ophth., **5**:392, 1931.
34. von Hippel, E.: On the pathological anatomy of glaucoma with remarks on retinitis pigmentation of the retina originating in the vitreous. Arch. f. Ophth., **52**:498, 1901.
35. Bourne, M. C., Campbell, A. R., and Tansley, K.: Retinitis in rats. Tr. Ophth. Soc. U. Kingdom, **58**:234, 1938.
36. Collins, T. E.: Tr. Ophth. Soc. U. Kingdom, **39**:165, 1919.
37. Gates, R. R.: Human Genetics, New York, Macmillan, 1946, pp. 76, 78, 209.
38. Posner, A., and Schlossman, A.: The role of inheritance in glaucoma. Tr. Am. Acad. Ophth., Jan.-Feb., 1948, p. 145.
39. Blessig, E: Alternating occurrence of glaucoma simplex and pigmented retina in a series of siblings. St. Petersburg Med. Woch., **26**:105, 1901.
40. Zondek, H., and Wolfsohn, G.: Glaucoma and pituitary function. Am. J. Ophth., **30**:596, 1947.

UNILATERAL RETINITIS PIGMENTOSA*

Report of a case

Dan M. Gordon, M.D.
New York

The occurrence of unilateral retinitis pigmentosa is one of the rarer events in ophthalmology. Beigelman,[1] in his review of the literature, in 1931, was able to collect only 10 cases, besides his own, which he felt fitted into this category.

He makes note of the fact that many writers have voiced doubt as "to the very existence" of this condition, and states, "Two objections are raised against cases reported as unilateral pigmentary retinitis; (1) The ophthalmoscopically and functionally normal eye might be affected in the future, particularly when the diagnosis is made on the basis of a single examination, or (2) the condition is not a true pigmentary retinitis but an acquired chorioretinal atrophy with pigmentation. Syphilis is often blamed."

Beigelman's own case was followed by him for over five years with no change in the "normal" eye and with increase in the severity of the affected eye.

Review of the literature

Four other cases of unilateral retinitis pigmentosa have been reported since Beigelman brought the subject up to date in 1931. The complete list, including those noted by him is as follows:

1. Pedraglia (1865) a man, aged 36 years, with affected right eye.
2. de Wecker (1868) a girl, aged 15 years, with affected left eye.
3. Baumeister (1873), a man, aged 44 years, with affected left eye.
4. Dehrig (1882), a woman, aged 46 years, with affected right eye.
5. Gunsburg (1890) a man, aged 42 years, with affected left eye.
6. Gonin (1902) a man, aged 25 years, with affected left eye.
7. Nettleship (1907) a woman, aged 30 years, with affected right eye.

* From the Cornell University Medical College and the New York Hospital.

8. Hine (1924) a man, aged 34 years, with affected right eye.
9. Rossi (1926) a woman, with affected right eye.
10. Shoji (1926) a girl, aged 10 years, with affected left eye.
11. Beigelman (1931) a woman, aged 36 years, with affected left eye.
12. Agatston (1939) a man, aged 53 years, with affected right eye.
13. Agatston (1939) a woman, aged 45 years, with affected left eye.
14. Schupfer[3] (1937) a woman, aged 55 years, with affected right eye.
15. Schupfer[3] (1937) a man, aged 24 years, with affected left eye.
16. Gordon (1948) a man, aged 26 years, with affected right eye.
17. Bentzen[4] (1917) a woman, aged 30 years, with affected right eye.
18. Lowegren[4] (1948) a woman, aged 63 years, with affected left eye.
19. Dreissler[4] (1948) a woman, aged 53 years, with affected left eye.

It is noteworthy that Beigelman's case was the first of such a condition to be reported from this country and that but three others, including mine, have since been reported from the United States.

Report of case

History. R. R., a 26-year-old white man, was first seen on June 11, 1946, when he stated that his eyes began tiring and tearing in 1944. He did not note any difficulty in darkness. He was in the Navy at that time and was examined by their medical officers on several occasions; finally, he was discharged in November, 1944, with a diagnosis of retinitis pigmentosa. He was seen at another eye clinic prior to his visit to the New York Hospital and was told that he had retinitis pigmentosa, which was more pronounced in his right eye than in his left.

Navy records. The patient has furnished photostatic copies of his Navy records, the pertinent data of which is, "Disability is not the result of his own misconduct and was incurred in line of duty. Vision 20/20 each eye on induction in the navy, October 23, 1940.

"This patient was admitted to the sick list September 4, 1944, from the staff of the hospital, complaining of difficulty in reading.

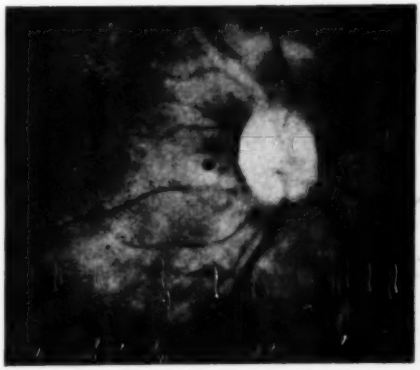


Fig. 1 (Gordon). The unaffected left eye.

Physical examination was essentially negative except for the eyes. Vision was: O.D., 10/20; O.S., 20/15. Pupils round, react to light and accommodation. Ophthalmoscopic examination of the right eye shows a small posterior polar opacity of the lens. The vitreous is clear. Examination of the fundus shows some attenuation of the arterioles. The disc is slightly pallid. In the entire periphery of the fundus there is a degeneration, proliferation and migration of pigment which over-lies the retinal vessels.

"Ophthalmoscopic examination of the left eye is essentially negative. Field studies of the right eye show a concentric contraction

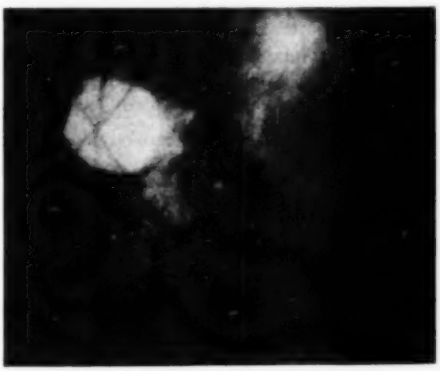


Fig. 2 (Gordon). The affected right eye. Note the blurring of the disc and the marked attenuation of the vessels. The arteries are barely visible.

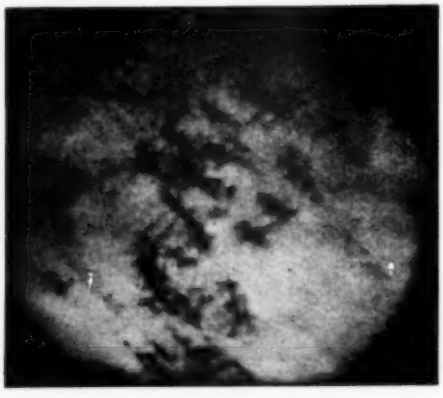


Fig. 3 (Gordon). Superior periphery of the right eye, showing the typical pigmentation.

to eight degrees. Field studies of the left eye show two small scotomas about 10 degrees in diameter in the extreme lower temporal quadrant and moderate concentric contraction. Routine laboratory examinations were negative and the spinal fluid Kolmer test was negative.

"The diagnosis of retinitis has been established."

Family history. This patient has gone into his family history very thoroughly and can find no evidence of the existence of any night-blinding disease in his ancestry. His parents were unrelated prior to marriage. He has two brothers and two sisters who have no visual complaints.

On physical examination here on June 11, 1946, his vision was: R.E. 20/70; L.E., 20/15 with J2 and J1, respectively. R.E., with a -0.5D. sph. $\bigcirc$ -0.25D. cyl. ax. 45°, he reads 20/30 on the Snellen chart. The external examination reveals no pathologic condition of note.

Fundus examination. R.E., there are some linear vitreous floaters. The disc is pale and somewhat blurred. The arteries are very attenuated. There is the typical golden metallic glinting reflex of the tapetoretinal diseases seen in the mascular area. There is dense midperipheral corpuscular shaped pigmentation with one small particle of pigment on the disc, nasally.

L.E., media are clear, the disc is normal in color and outline, the vessels are normal, no tapetoretinal reflexes. There is one small patch of pigment superotemporally, which is not spidery in shape.

Slitlamp examination reveals an early central posterior subcapsular lens opacity on the right. No lens opacities on the left.

Field studies. R.E., constricted to from 5 to 10 degrees; L.E., full and normal. Careful search with small white and with colored targets, failed to reveal the scotomas described by the Navy.

Discussion

The occurrence of the unilateral retinitis

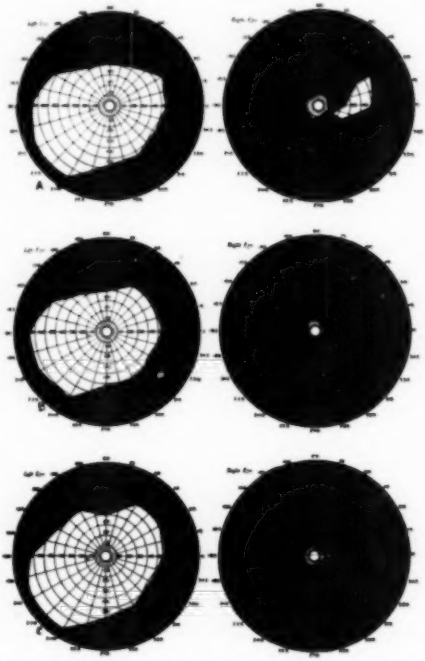


Fig. 4 (Gordon). A series of visual field charts, showing the progressive loss of visual field in the right eye, with essentially no change in the field of the left eye. (A) August 5, 1946, for 1/330 white. (B) August 14, 1947, for 1/330 white. (C) July 6, 1948, for 1/330 white.

pigmentosa (or a condition in every way similar to it) is chiefly of interest for two reasons. (1) Until recently the primary pigmentary degenerations of the retina have been considered as fairly well worked out and understood diseases, and (2) its occurrence runs counter to every etiologic theory that has been advanced thus far.

Atypical cases of primary pigmentary degeneration do occur and, with the exception of the condition now being discussed, are always bilateral. Hence, their existence has not conflicted with the various theories advanced to account for their etiology. All of these theories take into account a systemic etiology, whether it be diencephalic or abiotrophic. That either of these mechanisms can permanently affect only one eye is not conceivable. There would remain but one other explanation; trauma or disease of the afflicted one eye. Yet, neither of these conditions have been recorded as important factors in the histories of the cases reported. It is obvious that we have no satisfactory explanation for unilateral retinitis pigmentosa, and probably none for the bilateral form, either.

Agatston[2] states that "the suggestion of traumatic origin of the disease promoted by Wagenmann's experiments is not consistent with the statistics which show that retinitis pigmentosa following trauma is practically unknown."

Beigelman, in 1931, wrote in a similar vein and quoted A. L. Whitehead and M. H. Horning as "observing not a single case of bone corpuscle arrangement of pigment in the vast material of direct and indirect ocular injuries during the World War." He also stated that the literature does not contain a single convincing case of retinitis pigmentosa which was caused by or precipitated by trauma.

Beigelman went on to point out that Wagenmann, himself, described the changes produced, in his classical experiment of section of the ciliary arteries in rabbits, as resembling a healed chorioretinitis. This is a point which has been apparently overlooked by many who have concluded that Wagenmann produced a retinitis-pigmentosalike picture by his arterial sections.

The author has no further suggestion at present to add to the number of theories now confusing the literature as to the etiology of retinitis pigmentosa.

Summary

A case of retinitis pigmentosa occurring in but one eye, with the other eye apparently normal, is reported, and the literature brought up to date.

525 East 68th Street (21).

References

1. Beigelman, M. N.: Unilateral pigmentary retinitis. Arch. Ophth., **6**:254-261 (Aug.) 1931.
2. Agatston, S. G.: Report of two cases of unilateral retinitis pigmentosa. Am. J. Ophth., **22**:420-421 (Apr.) 1939.
3. Schupfer, F.: Sulla forma monolaterale della retinosi pigmentosa. Bull d'ocul., **16**:557-587 (June) 1937.
4. Dreissler, K. K.: Unilateral retinitis pigmentosa. Acta Ophth., **26**:385, 1948.

OCULAR MANIFESTATIONS OF PRIMARY NASOPHARYNGEAL TUMORS*

DAVID C. BOYCE, M.D., AND NORMAN BOLKER, M.D.
Iowa City, Iowa

Ocular signs and symptoms are common in patients with primary nasopharyngeal tumors, but, as far as is known, there are only two reports on this subject in the American ophthalmic literature.[1, 2] Therefore, it seems worth while to report the results of a survey of the 44 cases of this type which have been seen in the University Hospitals during the past 15 years.

TYPES OF TUMORS

Tumors of the nasopharynx may be either benign or malignant. Among the benign types are fibroma, hemangioma, neurofibroma, lipoma, xanthoma, dermoid, teratoma, chondroma, and mixed tumors.

By far the most common of these is the fibroma; this tumor arises from the periosteum covering the bony walls of the nasopharnyx and usually occurs in young adults, developing in the years of puberty and spontaneously regressing during the twenties. It has a smooth, vascular structure which histologically resembles fibrosarcoma, but it never infiltrates or metastasizes. Its most common symptoms are nasal bleeding and obstruction.

Malignant neoplasms of the nasopharynx are relatively more common than nonmalignant tumors. They are more often seen in males and occur more frequently in younger individuals than other malignant growths of the upper respiratory and alimentary tracts.[3] Godtfredsen[4] has pointed out that the most common site of origin of a primary malignant tumor of the nasopharynx is in the lateral wall, and it was his impression that about half of the malignant tumors arose from this portion. The second most frequent site was the roof and the least was the posterior wall of the nasopharynx.

Hayes Martin, however, claimed the tumors arise more often from the posterior wall in the region of the nasopharyngeal tonsil with the lateral wall less often involved.[3]

The most common form of malignant growth noted in the nasopharynx is the epidermoid carcinoma. Lympho-epithelioma, neuroblastoma, sarcoma, fibrocytoma, and adenocarcinoma are encountered in fewer numbers.

AGE AND SEX DISTRIBUTION

In this series of cases, the age and tumor type incidences agree in general with those reported by others (tables 1 and 2). The

TABLE 1
AGE DISTRIBUTION OF MALIGNANT NASOPHARYNGEAL TUMORS

Years	*Number*
0– 9	1
10–19	6
20–29	2
30–39	2
40–49	5
50–59	8
60–69	7
70–79	1

TABLE 2
DISTRIBUTION OF TUMOR TYPES IN 44 PATIENTS WITH NASOPHARYNGEAL TUMORS

Malignant:	
Epidermoid carcinoma	18
Undifferentiated epidermoid carcinoma	7
Lympho epithelioma	4
Neuroblastoma	1
Sarcoma	1
Fibrosarcoma	1
Adenocarcinoma	1
Lymphosarcoma	1
Nonmalignant:	
Juvenile fibroma of Ewing	7
Sclerosing angioma	2
Unknown:	1

* From the Departments of Ophthalmology and Radiology, State University of Iowa Hospitals.

distribution by sexes conforms to that usually reported, there being 25 males and only 9 females in this group.

Symptoms

Characteristically, primary malignant tumors of the nasopharynx do not cause symptoms during the early stages of development. The patient comes for examination usually because of enlarged cervical lymph nodes, occasionally because of manifestations of intracranial involvement, and less often because of symptoms localized to the nasopharynx.[5] It is not uncommon to find that patients have received treatment for a variety of supposed diseases before a proper diagnosis is made. In our series, nasopharyngeal symptoms were more common than those from intracranial involvement, probably because nine cases of benign tumors are included in the series.

The cervical lymph nodes most frequently involved are those situated beneath the mastoid tip under the upper end of the sternocleidomastoid muscle. Auditory symptoms, such as tinnitus and deafness, are present early as the tumor is often located next to the orifice of the Eustachian tube. When the tumor erodes the base of the skull, cranial nerve palsies develop.

The tumor may infiltrate the parapharyngeal space or pass through nearby foramina, particularly those in the base of the skull. Frequently invasion is through the foramen lacerum whereby the tumor gains access to the region of the carotid artery, the cavernous sinus, and the sensory and motor nerves to the globe.

Of the cranial nerves, the abducens and trigeminal are most commonly affected. Once the tumor has reached the middle cranial fossa, it may grow forward through the superior orbital fissure into the orbit, thus giving rise to the various ocular complications such as optic atrophy, choked disc, and proptosis. Systemic metastases are seen in one third of the patients, the skeletal system being most often involved with the liver and lungs next in order.[6]

TABLE 3

SIGNS AND SYMPTOMS PRESENTED ON ADMISSION BY 44 PATIENTS WITH NASOPHARYNGEAL TUMORS

Signs	Number	Percent
Cervical lymphadenopathy	24	54.4
Nasal obstruction	20	45.5
Epistaxis	20	45.5
Hearing loss	15	34.0
Headache	11	25.0
Ocular symptoms	10	22.7
Dysphagia	8	18.2
Pain over face	6	13.5
Weight loss	5	11.0
Hoarseness	4	9.0
Fullness in throat	4	9.0
Tinnitus	3	6.8
Sore nose	2	4.5
Speech defect	1	2.2
Swelling of face	1	2.2
Pain in arm and chest	1	2.2
Post nasal drip	1	2.2

Diagnosis

In our series, diagnosis was made by direct visualization of the tumor in all cases and proved by biopsy in all but one case. On admission, 54 percent of the 44 patients had palpable cervical nodes. Nasal obstruction, epistaxis, and poor hearing were present somewhat less frequently. Headache and ocular symptoms were noted in approximately 25 percent of the patients in this series. Dysphagia, facial pain, weight loss, hoarseness, and a variety of other symptoms were noted in decreasing numbers (table 3).

Ocular manifestations

Thirty-two percent of the 44 patients developed ocular manifestations at some time

TABLE 4

SUMMARY OF OCULAR MANIFESTATIONS SHOWED BY THE PATIENTS WITH NASOPHARYNGEAL TUMORS

Ocular involvement	Number
6th nerve	10
3rd nerve	7
Proptosis (all unilateral)	4
4th nerve	2
2nd nerve	1
Choked disc	1
Horners syndrome	1
External ophthalmoplegia	1
Corneal anesthesia	1
Pressure over eyes	1
Photophobia	1

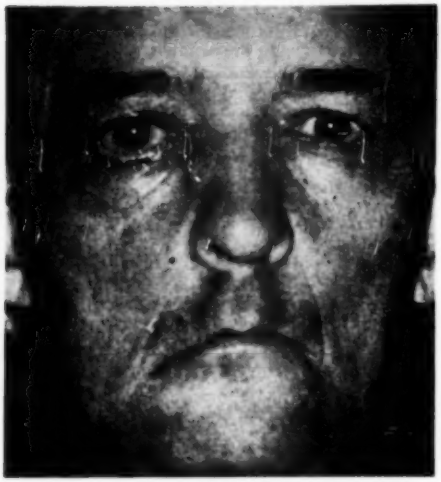


Fig. 1 (Boyce and Bolker). W. F., a 50-year-old man, with epidermoid carcinoma of the nasopharynx. He had slight exophthalmos on the right, 5th-nerve paresis, 12th-nerve paralysis, and 7th-nerve paralysis.

during the course of their disease. Most of those showing ocular signs were found to have malignant tumors. The ocular signs and symptoms were multiple in 54 percent of the patients. Involvement of the abducens was most common, while oculomotor and trochlear nerve palsies were noted in fewer cases. There were four cases of unilateral proptosis (table 4).

Case reports

The following three cases are typical of those showing ocular manifestations:

Case 1. E. F., a white man, aged 50 years (fig. 1), was first seen in August, 1947, because of deafness and a feeling of pressure in the right ear. Transient diplopia had been noted in October, 1946. Pain over the right side of the face and enlargement of the right cervical lymph nodes had been present for five months.

At examination, he was found to have an epidermoid carcinoma of the right nasopharynx which produced a small amount of exophthalmos of the right globe, paresis of the ophthalmic branch of the trigeminal nerve, and paralysis of the hypoglossal nerve. Roentgenograms showed erosion of the base of the skull. This patient was given a course of roentgen therapy. He returned a few months later showing a right facial paralysis and an exposure keratitis.

Case 2. K. A., a 13-year-old boy (fig. 2), was first seen in December, 1947, at which time he had had nasal obstruction for 13 months, episodes of epistaxis for 12 months, and proptosis of the left eye for 1 month. He was found to have a juvenile fibroma of the nasopharynx.

Roentgenograms of his skull did not reveal any erosion, and the tumor was presumed to have extended through orbital foramina into the orbit. He received roentgen therapy and no recent increase in symptoms has been noted 6 months after treatment.

Case 3. J. Y., a 3-year-old girl (fig. 3), was seen in 1940. Her parents gave a history indicating that she had had nasal obstruction, abducens palsy, frequent nose bleeds,

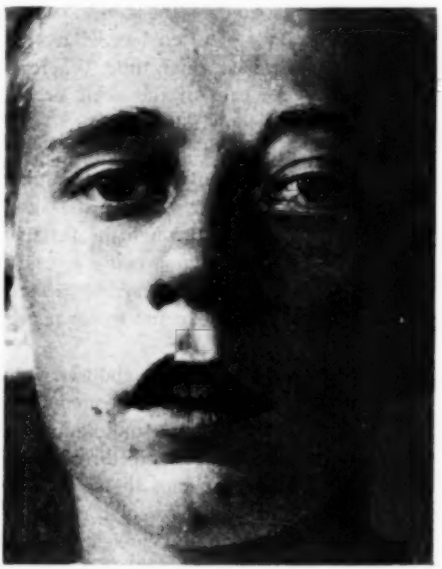


Fig. 2 (Boyce and Bolker). K. A., a 13-year-old boy, with juvenile fibroma of the nasopharynx showing exophthalmos of the left eye.

and proptosis of the right eye for several months.

On physical examination, she was found to have bilateral choked discs. No abdominal masses were noted. After microscopic examination, the tissue from the nasopharynx was diagnosed as neuroblastoma. The exophthalmos decreased following roentgen therapy. Two months later, an abdominal mass became evident. The patient died three months after admission.

Although the nasopharynx is an unusual primary site for neuroblastoma, cases have been known to occur there, and the growth characteristics as seen at the time of exploration through both an orbital and nasopharyngeal approach would indicate this to be true in this instance.[6]

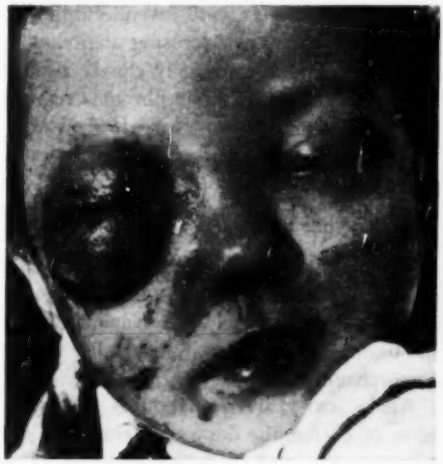


Fig. 3 (Boyce and Bolker). A 3-year-old girl with neuroblastoma of the nasopharynx. She showed proptosis of the right eye, bilateral choked discs, and paralysis of the 6th nerve on the right. She died three months after admission.

Treatment

The most generally accepted method of treatment of malignant tumors of the nasopharynx is roentgen irradiation. Radium is not often used as it is difficult to apply to this site. Since the lesions are deep, multiple ports are needed to deliver an adequate tumor dose without over-irradiating the skin. Highly penetrating beams, as produced by high voltages and heavily filtered rays, are essential to successful treatment. Care should be taken to shield uninvolved radiosensitive tissues such as the pinna of the ear and the structures of the anterior segment of the eye.

At this hospital the treatment of a malignant nasopharyngeal tumor varies, depending on the proposed effect of treatment, whether curative or palliative, and the response of the tumor to irradiation. A curative effort is made in every case without evidence of distant metastasis.

Skull involvement as demonstrated by roentgenograms is not considered a definite contraindication for a curative effort. The best results are obtained with patients who report for treatment before the appearance of enlarged cervical nodes.

A tumor dose of approximately 3,500 to 5,000 r is desired, and this is achieved by the administration of 2,600 to 3,400 r in air to each of 2 or 3 fields. In a centrally located lesion, 4 fields may be used, both right and left lateral nasopharyngeal and right and left oblique maxillary fields. In addition to the primary tumor, the involved cervical lymph nodes are also treated.

Palliative treatment is administered to relieve pain and nerve palsy, decrease exophthalmos, nasal obstruction and epistaxis, and to improve the general condition of the patient when the extent of the disease precludes a cure. Treatment is stopped when these objectives are attained.

Following treatment the primary lesion usually regresses rapidly, the only evidence of involvement being a defect of the pharyngeal mucosa which closes over with epithelium. Ordinarily there is no recurrence at the primary site, but rather in the lymph nodes. Pain from nerve involvement is often relieved after the first few treatments. The radiation reaction of the skin is transient and leaves minimal changes with properly given treatment.

With two exceptions, all of the benign

tumors in our series were juvenile fibromas. The exceptions were sclerosing angiomas, a tumor which is histologically closely related to fibromas. Since juvenile fibromas regress spontaneously in a few years after puberty, the object of treatment is not so much eradication of the tumor as restriction of its harmful effects until they are physiologically remedied. Efforts are made to decrease the frequency of epistaxis and expansion of the mass. Surgical extirpation is contraindicated due to the exceedingly vascular nature of the tumor. In fact, biopsy may cause severe hemorrhage.

Again, external irradiation is the treatment of choice, the dosage varying with the response to irradiation and ranging from 1,000 r to 2,500 r tumor doses.

Comment

Tumors of the nasopharynx, while uncommon, should none the less be kept in mind by the ophthalmologist for he may be the first to be consulted by the patient. If he is aware of the usual findings in this type of tumor, he may make the diagnosis early and give the patient the benefit of more prompt treatment.

Summary

Carcinoma of the nasopharynx is rarely diagnosed correctly early because of the silent nature of the primary tumor and the difficulty of adequately examining the area. Usually the secondary manifestations of the tumor achieve prominence before diagnosis is made.

Forty-four consecutive cases of nasopharyngeal tumors seen over the past 15 years are reviewed; 34 were malignant, 9 nonmalignant, and 1 of unknown type. Thirty-two percent of the cases showed ocular signs or symptoms at some time during the course of the disease. Abducens palsy was most common of this group. Proptosis and lesions of the optic, oculomotor, and trochlear nerves were present in lesser numbers. When ocular manifestations were present, the prognosis was poor. The treatment of choice has been roentgen therapy.

University Hospitals.

The authors acknowledge the aid of Dr. Otis S. Lee, Jr., Dr. C. S. O'Brien, and Dr. H. Dabney Kerr in the preparation of this paper.

References

1. Hardy, G.: Ocular symptoms—tumors of nasopharynx. Am. J. Ophth., **23**:446-447 (Apr.), 1940.
2. Schlivek, K.: Ocular manifestations of cases of cancer of the nasopharynx. Arch. Ophth., **17**: 1055-1072 (June), 1937.
3. Jackson, C.: Diseases of the Nose, Throat, and Ear. Philadelphia and London, Saunders, 1945.
4. Godtfredsen, E.: Ophthalmo-neurological symptoms in connection with malignant nasopharyngeal tumors. Brit. J. Ophth., **31**:78-100, 1947.
5. Ackerman and del Regato: Cancer Diagnosis: Treatment and Prognosis. St. Louis, Mosby, 1947.
6. Ringertz, N.: Pathology of malignant tumors arising in the nasal and paranasal cavities and maxilla. Acta oto-laryng. Supplement XXVII, 1938.

A STUDY OF THE EFFECT OF RETROBULBAR ANESTHESIA ON THE OCULAR TENSION AND THE VITREOUS PRESSURE*

HAROLD GIFFORD, JR., M.D.
Omaha, Nebraska

Ever since Elschnig[1] popularized the use of retrobulbar anesthesia in 1925 it has been known that the ocular tension is lowered by this procedure. Atkinson[2] has pointed out that there tends to be a deepening of the anterior chamber. Icaza[3] and Levett[4] suggested the use of retrobulbar injection to relieve pain and lower the tension in acute glaucoma.

The studies of vitreous loss by Wright,[5] Lancaster,[6] Kirby,[7] and myself,[8] have shown that there is a posterior segment pressure which is an important problem in cataract surgery. Elschnig, DeGross,[9] Dunphy,[10] Greenwood and Grossman,[11] and my brother, Sanford Gifford,[12] all have reported that the use of retrobulbar injection reduces the amount of vitreous loss in cataract surgery.

Ferrer,[13] Bothman,[14] and Lombardo,[15] checked the ocular tension before cataract operations but made no special separation of ocular tension and vitreous pressure. Ferrer believed that a high preoperative tension was a danger signal. Lombardo demonstrated that a lower preoperative tension was a good prognostic sign. Bothman reported only 1 case of vitreous loss in 23 cases with a high preoperative tension, and 2 cases had inverted flaps or low vitreous pressure at the time of operation.

Ferrer[16] in a later paper pointed out the fact that ocular tension did not cease when the chamber was opened. He noted that some eyes had an increased tension but he did not attempt to analyze the difference between ocular tension and vitreous pressure.

It seemed to me that a detailed study of the mechanism that produces this lowering of intraocular pressure might bring to light some interesting physiologic facts which might lead to safer cataract surgery, and perhaps to a better understanding of the etiology of glaucoma. I have been working on a method to produce complete motor paralysis of the extraocular muscles. With this work I have collected a series of cases in which the intraocular pressure was measured on the operating table before the retrobulbar injection and five minutes after it. These cases and some others form the basis of this preliminary report. It is hoped that this report will stimulate the interest of others to study this problem, since it is an important part of the physiology of the eye that has received very little attention. I would like to say that this is by no means a controlled experimental study, but simply a review of clinical findings and an attempt to evaluate these findings in the light of our present knowledge.

The technique of the orbital injection varied slightly but in general 2 cc. of 2-percent novocain containing adrenalin 1:1,000 was injected deep into the orbit, using a 5-cm., No.-25 needle. In some cases 4-percent novocain was used and the exact amount of adrenalin was not measured carefully except in the later cases in which 0.4 cc. to the ounce was used. The patients all had some basal anesthesia, sodium ortal or morphine and scopolamine. Also 4-percent and 10-percent cocaine with pilocarpine (1 percent) and adrenalin drops were instilled in the conjunctival sac, starting 20 minutes preoperatively. The facial nerve was blocked as completely as possible, using both the O'Brien[17] and Van Lint[18] methods. In many cases the Klein[19] technique was also added.

The tension was taken with the Schiøtz tonometer (sterilized in zephiran (1:1,000) just before the retrobulbar injection and the second tension five minutes later. If the orbital injection is properly placed deep in

* Presented at the 84th annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, May, 1948.

the base of the orbit, the motor block comes on almost at once and the patient is unable to move the eye in any direction when asked to look up or down, right or left. This effect was graded on a percentage basis, counting 20 percent off for each rectus still functioning and 10 percent for each oblique still active. For example, if the eye rotated only laterally, the motor block was considered to be 80 percent perfect. If two muscles were still active, the block was considered to be 60 percent effective. If movement was good in all directions but one, the motor block was listed as only 20 percent. There were also slight gradations for partial functions.

In the cataract operations, it was possible to set up a standard for posterior segment pressure—or vitreous pressure, as I have called it. When the eye is opened with a Graefe knife, the lens and iris diaphragm moves forward in the majority of cases, just filling the anterior chamber. This was recorded *as normal vitreous pressure.* If this movement forward was sufficient to cause gaping of the wound, a prolapse of the iris, or a horizontal wrinkle in the cornea, this was considered to be evidence of *positive vitreous pressure.* If the cornea collapsed or if the iris diaphragm did not move forward to fill the anterior chamber and an air bubble filled the chamber spontaneously, this was considered to be evidence of *negative vitreous pressure.*

Before looking at the clinical findings, it will make things more understandable if we review our knowledge of what takes place when novocain and adrenalin are injected behind the globe. The depth of the injection, of course, has some effects on the results. The novocain when injected deeply blocks the motor nerves, which relaxes the extraocular muscles more or less completely. The novocain also blocks the sensory nerves entering the base of the orbit, chiefly the nasociliary branch of the trigeminal. This produces anesthesia of the entire globe with anesthesia of the conjunctiva surrounding the cornea. It should block *both* the sympathetic and parasympathetic activity coming to or from the ciliary ganglion. The pupil dilates with a simple paralysis of the third nerve, but in my cases the pupil remained small because the iris was under the influence of cocaine and pilocarpine. I do not know what happens to the ciliary muscle. I hope that Dr. Harold G. Scheie will be able to tell us. The anterior chamber, however, becomes noticeably deeper in most cases. Is this effect due to relaxing the tone of the ciliary muscle? What happens to the vessels in the choroid? Do they dilate or constrict? A definite correlation between deepening of the anterior chamber and drop in tension has not yet been made.

The novocain placed this far back in the orbit should also block the optic nerve but for some reason this does not take place. Perhaps the optic-nerve sheath protects the nerve. I have checked the vision in most of these cases and have found the optic nerve to be as fully active as the state of the eye would permit. That is, in the aphakic cases these patients could count fingers promptly and accurately at the close of the operation and there was no gross field defect.

It has been generally accepted that the adrenalin placed in with the novocain is the drug that produces the lowering of the tension. Dr. Walter Atkinson believes that the adrenalin produces its effect by constricting the small arteries entering the globe but not affecting the venae vorticosae, which are more forward. I will present some findings later which indicate that the answer to the effect of the adrenalin is not this easy. To my surprise, I found that the effect of the adrenalin was relatively small and I am still in doubt as to just where the effect takes place.

This present study is based on 65 cataract operations and 40 glaucoma operations which had complete records of the tension before and five minutes after a deep orbital injection. Also the amount of motor block and the vitreous pressure after the globe was opened were recorded. There should be some rela-

tionship between the percentage of lowering of the ocular tension, the percentage of motor block, and the state of the vitreous pressure. The age of the patient may be an important factor, since this influences the rigidity of the sclera and the expansibility or contractability of the vascular bed. The vitreous body also changes with age, tending to become more fluid and perhaps changing in other properties as well. It is obvious from looking at these variable factors that the problem is not a simple one.

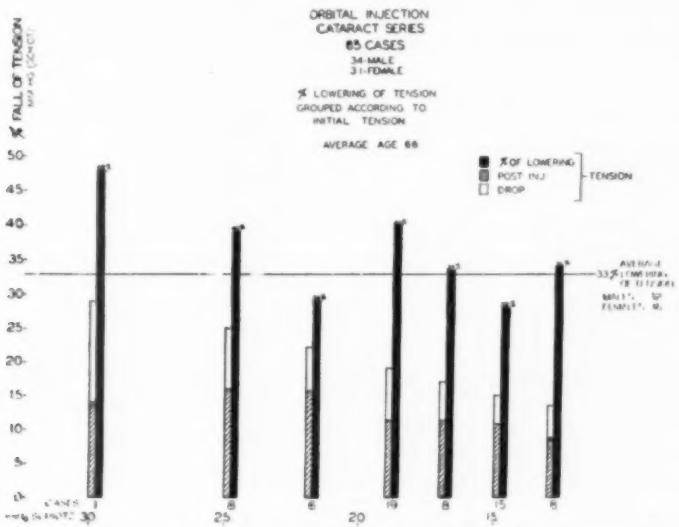


Chart 1 (Gifford). The percentage of lowering of the tension increases only slightly with an increase in the initial tension.

It was noticed immediately that the actual amount of drop in tension depends on the initial level of the intraocular pressure and that the percentage of lowering of tension would give a better figure to use for this study. The amount of drop in tension was therefore changed to percentage of lowering of the tension. From Chart 1, it is seen that the percentage of lowering of the tension increases only slightly with an increase in the initial tension. The average percentage of lowering for the cataract series was 33. There were wide variations ranging from 60 percent to no drop at all. The chart also shows that, along with the rise in initial tension, the base pressure goes up, starting at 10 and increasing to 15 mm. Hg. This will be considered later when discussing the 40 cases of glaucoma.

In the cataract series there were 34 males with an average lowering of tension of 31.9 percent and 31 females with an average lowering of 36 percent. This slight difference is probably not significant and would indicate that sex difference does not play a part in the tension-lowering mechanism.

The age of the patient did not influence the percentage of motor block. The average age of the 34 cases with more than 65 percent motor block was 65.9 years. For the 31 cases with less than 65 percent motor block the average age was 65.2 years. However, age seems to have some correlation with the state of the vitreous (Chart 2).

The average age for the cases with negative pressure was 69 years. The average of

the cases with normal vitreous pressure was 65 years, while the average of cases with positive vitreous pressure was 61 years.

was 37 percent. The average age for the entire group was 66 years. This is a relatively old group in which sclerotic vascular

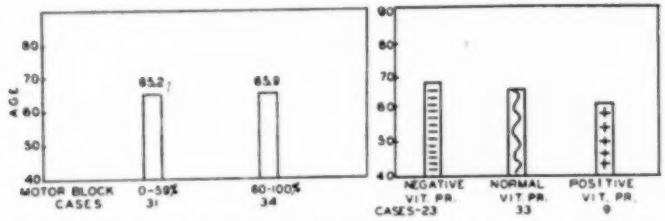


Chart 2 (Gifford). Age seems to have some correlation with the state of the vitreous.

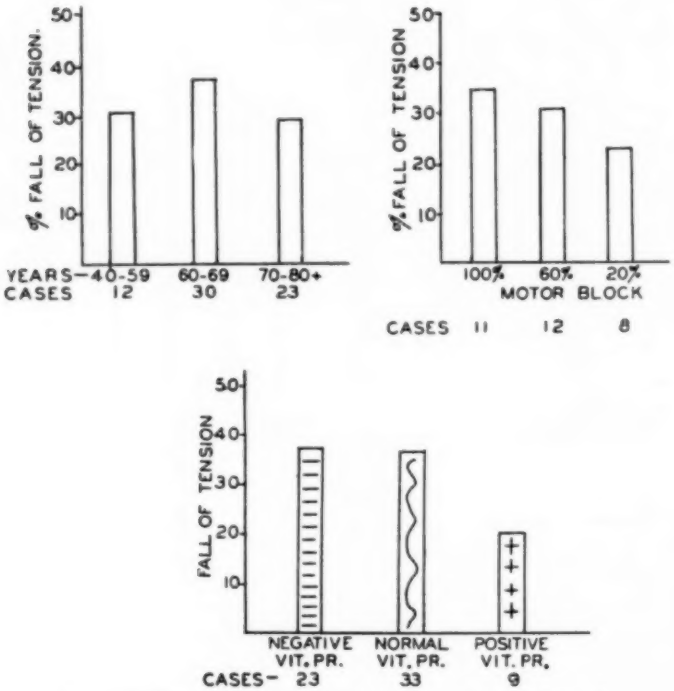


Chart 3 (Gifford). Effect of motor block on ocular tension and vitreous pressure.

The age of the patient does not seem to have a great effect on the percentage of lowering of tension.

The older and younger groups had slightly less fall—29 percent and 30 percent respectively—than the middle age group, which

changes are present. If a really young group were checked, they might show more difference or they might show a similar percentage of lowering due to the compensating effect of a more elastic sclera.

Chart 3 also shows the effect of the per-

centage of motor block on the percentage of lowering of tension.

Eleven cases with 100-percent motor block had an average lowering of tension of 34.6 percent, 12 cases with 60 percent motor block an average of 31 percent and 8 cases with 20 percent or less motor block showed only 25 percent.

The bottom part of Chart 3 shows that the percentage lowering of tension has only a little correlation with the negative and normal vitreous pressure, the average percentage of lowering being 37.6 and 36.6 respectively. The positive vitreous cases showed a percentage lowering of 19.9. This would indicate some correlation with positive vitreous pressure.

In attempting to explain the mechanism of the fall in intraocular pressure, the percentage of motor block was correlated with the percentage of tension lowering and the state of the vitreous pressure.

Chart 4 shows that as the percentage of motor block increases, the percentage of tension lowering increases (37.1), and also when the percentage of motor block is poor the percentage of tension lowering is less (28). This would indicate that the extraocular muscles play a part in maintaining normal ocular tension and when they are relaxed by the orbital injection the percentage of lowering is greater. This chart also shows the effect of the motor block on the vitreous pressure. There were only two cases of positive pressure when the motor block was better than 65 percent. There were seven cases when it was less than 65 percent.

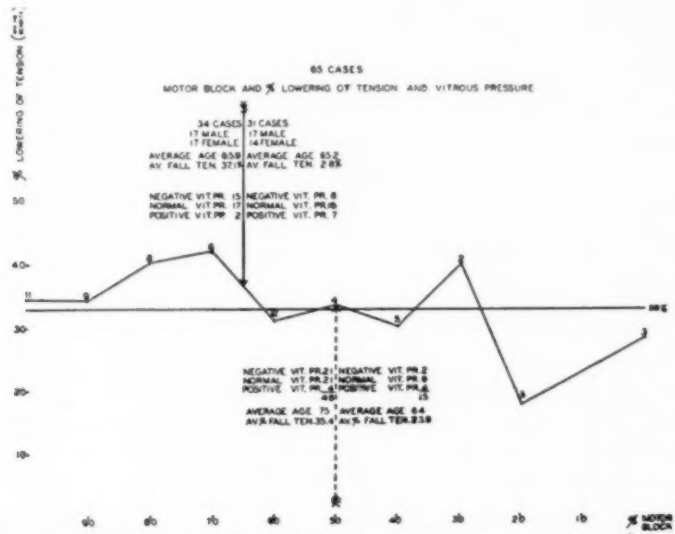


Chart 4 (Gifford). Correlation of the percentage of motor block with the percentage of tension lowering and the state of the vitreous pressure.

The effect of the motor block on the vitreous pressure and the percentage lowering of tension are shown graphically in Chart 5.

When the motor block was good there were more cases with negative pressure. The effect of the muscle tone was larger in this direction. When the percentage of lowering of tension was poor there were more cases of positive vitreous pressure. This is not an absolute correlation. There is some other factor operating. This appears to be the age of the patient. The three factors—age, percentage of lowering of pressure, and the

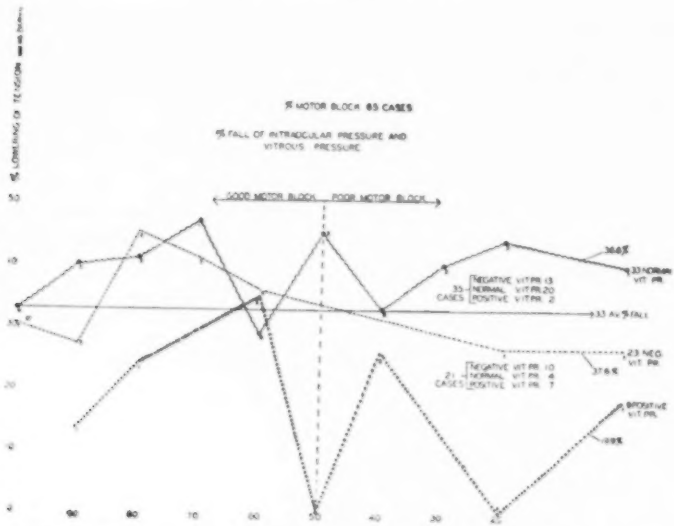


Chart 5 (Gifford). Graphic presentation of the effect of the motor block on the vitreous pressure and the percentage lowering of tension.

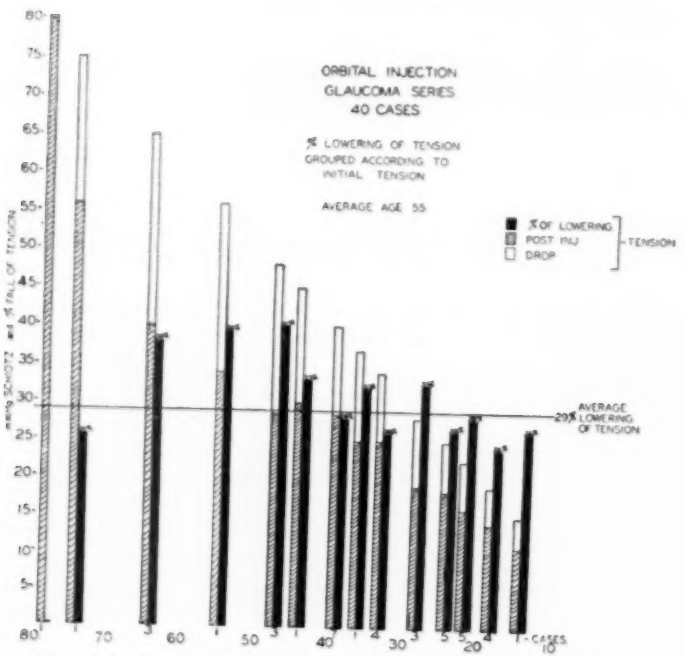


Chart 6 (Gifford). Percent of lowering tension grouped according to initial tension in a study of 40 glaucoma cases.

amount of motor block—all affect the vitreous pressure and in any individual case all three must operate in the same direction to be sure of producing either negative or positive vitreous pressure. Any one factor may overshadow the effect of the other. This was shown to be true in several individual cases. A patient, aged 73 years, with a small percentage drop, 15, had a negative vitreous pressure but a 90-percent motor block. The patient with the lowest initial pressure, 10 mm. Hg, had only a 20-percent drop and only 60-percent motor block, but negative vitreous pressure. He was 88 years of age. In this case, age was a deciding factor. For practical purposes in cataract surgery, youth, a low percentage of tension lowering, and poor motor block will tend to produce positive vitreous pressure. But if any of these three factors can be changed sufficiently, normal or negative pressure may be the result. Conversely, old age, a good motor block and a large percentage of fall will produce negative vitreous pressure, but if one of these is missing positive vitreous pressure may result.

The 40 glaucoma cases are shown on Chart 6. These are grouped according to the initial preinjection tension.

Like the cataract series, there is a tendency for the percentage of lowering of tension to be greater with a higher initial tension, but the average percentage of lowering was slightly less, being 29. This must be due to a continued rise in the base pressure. The rise in the base pressure is shown very clearly. It seems to me that this is the same base pressure brought out by Dr. A. B. Reese in his paper read before this society last year.

If this proves to be the case, an orbital injection would provide a quick and simple method for determining this base pressure. This would eliminate the "long-range perspective" that Dr. Reese feels is so desirable to determine the choice of operation for each individual patient. A high base pressure would indicate a trephination or Lagrange sclerectomy. The oribtal injection might also prove to be a useful provocative test in preglaucoma patients. It will take considerably more study to set up normal percentage-lowering curves but I am sure such curves would be invaluable in understanding and treating glaucoma.

How does the orbital injection produce its tension-lowering effect? I have shown that relaxing the extraocular muscles has some influence on reducing the tension.

The adrenalin which has generally been given the credit for the tension-lowering effect, surprisingly, does not seem to be necessary (table 1).

Table 1 shows that it is possible to produce a slightly greater than average percentage of lowering of tension without any adrenalin in the orbital injection. The average for five cases was 35.6 percent. Saline

TABLE 1

CATARACTS (2 PERCENT NOVOCAIN, NO ADRENALIN)

Age	Tension			Percent of Lowering	Motor Block
	Pre-injection	Post-injection	Drop		
73	15	11	4	27	60%
76	17	9	8	49	79
81	22	17	5	23	70 B.P. +8
56	15	9	6	40	70 B.P. −5
64	17	10	7	41	100 B.P. +12
				Avg. 35.6	

alone will not cause a lowering of the ocular tension but adrenalin alone has some effect.

Saline and adrenalin were injected the day before operation and the tension checked (broken line). At the time of operation, the same amount of adrenalin was added to the novocain and the tension again checked (solid line). See Chart 7.

The effect of the adrenalin alone was not as great as when it was combined with novocain in the first case. There was slightly more lowering of tension with the adrenalin alone in the second, and about the same amount in the third. More of these cases will have to be done before the effect of adrenalin alone can be evaluated precisely.

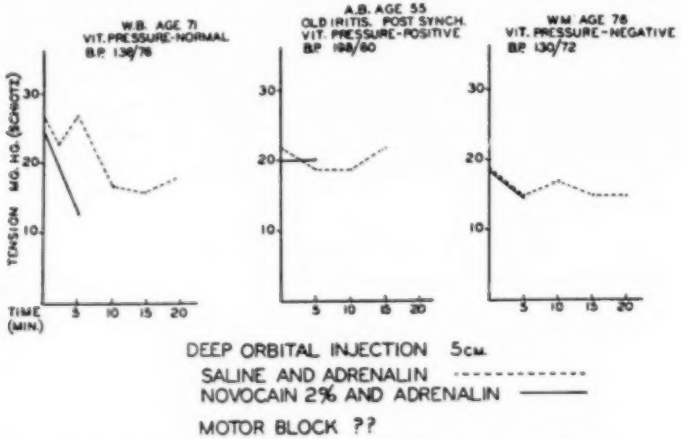


Chart 7 (Gifford). Tension curves produced by deep orbital injection.

A similar tension-lowering effect can be produced by sodium pentothal anesthesia (table 2).

This would indicate that there is a higher center in the brain for control of ocular tension. Since the amount of the effect is about the same as when an orbital injection is used, it would indicate that they both act

TABLE 2

GLAUCOMA. SODIUM PENTOTHAL

Age	Name	Eye	Tension			Percent of Lowering
			Pre-injection	Post-injection	Drop	
Acute Primary Glaucoma						
59	O. P.	O.D.	25	19	6	24 with sodium pentothal
		O.S.	40	29	11	27 with sodium pentothal
		O.D.	65	48	17	26 with retrobulbar
		O.S.	40	26	14	35 with retrobulbar
Acute Secondary Glaucoma						
42	R. H.	O.D.	48	48	0	0 with sodium pentothal
		O.S.	50	50	0	0 with sodium pentothal
		O.S.	48	48	0	0 with retrobulbar

by blocking or inhibiting certain nerve stimuli. Since the adrenalin acts by stimulating the sympathetics and produces the same effect, it seems to me that the novocain must produce its tension-lowering effect by blocking the parasympathetic activity of the third nerve and the ciliary ganglion. How this effect is produced is unknown. At present this is not much more than a working hypothesis but it seems to apply to the normal eye at least.

The glaucomatous eyes, in general, seem to respond to the orbital injection about the same as normal eyes but with slightly less percentage of tension lowering because the base pressure has become elevated.

In acute glaucoma, however, there were some exceptions (table 3).

There were three cases where no reduction of tension occurred. These eyes had lost their tension-lowering capacity. It seems that the base pressure had simply become ele-

TABLE 3

ORBITAL INJECTION FOR ACUTE GLAUCOMA

Age	Sex	Tension		Percent of Lowering	Time
		Pre-injection	Post-injection		
76	F.	65	40	38.4	20 minutes
78	F.	75	75	00.0	1 hour
82	M.	56	30	35.7	1 hour
41	M.	48	48	00.0	1 hour
72	F.	90+	90+	00.0	30 minutes

TABLE 4

TENSION OF ENUCLEATED EYES

Age	Sex	Name	Diagnosis	Pre-injection	Post-injection	After Muscles Cut	Eye Enucleation
52	F.	A. B.	Abs. Glau.	90+	76	90	30
39	M.	J. H.	Staphyl. C. Sec. Glau.	76	48	56	15
70	M.	C. L.	Mel. of Iris. Sec. Glau.	47	47	35	18
77	M.	E. K.	Hem. Glau.	90	62	75	90+
46	M.	R. O.	Mel. of Limb.	17	9	4	9
60	F.	M. C.	Mel. of Choroid	8	6	6	?

TABLE 5

ORBITAL INJECTION WITH NO DROP IN TENSION

Age	Sex	Tension			Percent Motor Block	Vitreous Pressure	Remarks
		Pre-injection	Post-injection	Drop			
55	M.	22	22	0	80	+	Old iritis. Post. synch.
47	F.	15	15	0	20	+	Loss of vitreous.
71	M.	15	15	0	20	0	Morgagnian cataract. Poor facial block.
71	M.	15	15	0	50	+	Japanese-shallow orbit. Orbital injection only 5 cm. deep; also block. Near vitreous loss.

vated to a point equal to the initial pressure.

The tension was checked during and after enucleation in several cases (table 4).

Table 4 shows that the eyes with a high base pressure actually maintain some or all of this pressure after the eye has been removed from all nervous and circulatory control. It demonstrates that there may be an actual anatomic change in these eyes that is producing the elevation of the base pressure.

Some eyes failed to show any response to orbital injection, although the initial pressure was low. These eyes were not glaucomatous (table 5).

Table 5 shows four cases that did not show any drop in tension when the initial pressure was low. One eye had had a severe iritis but in the others the lack of drop in tension could be explained only on the basis of a poor motor block or some specific anatomic change that produces an eye that has no tension-lowering potential.

Conclusions

This study would indicate that in the normal eye there is a dynamic factor controlled by the nervous system that produces a certain amount of the ocular tension. This seems to be a relatively constant factor amounting to about 33 percent of the initial ocular tension. This dynamic factor is influenced by the tonus of the extraocular muscles and the parasympathetic activity of the third nerve. It can be separated from the total ocular tension by an orbital injection of 2-percent novocain, adrenalin, or sodium-pentothal anesthesia. This leaves a residual or base pressure that shows a tendency to increase slightly in the normal eye as the intraocular pressure rises. This base pressure is maintained by still-unknown factors but must in some way be associated with the hydrostatic pressure of the blood and the elasticity of the sclera.

This study would indicate that, in the glaucomatous eye, the base pressure has become elevated, in some eyes to such a degree that there is produced an anatomic change that resists all tension-lowering devices, such as drops, orbital injection, cutting the recti muscles, and even enucleation.

I feel certain that further clinical study and basic research on the choroid and its association with the ciliary body is necessary before the glaucoma problem can be solved. I know certainly that the percentage of vitreous loss in cataract surgery can be greatly reduced by using a deep orbital injection that produces a motor block of the extraocular muscles as well as more complete anesthesia, and a lowering of the intraocular pressure.

1620 Medical Arts Building (2).

References

1. Elschnig, A.: Am. J. Ophth., **8**:355-361, 1925.
2. Atkinson, W.: Arch. Ophth., **30**:19, 1947.
3. Icaza, M. J.: Arch. Ophth., **35**:361-365, 1946.
4. Levett, J. M.: Dis. Eye, Ear, Nose & Throat, **2**:249-252, 1942
5. Wright, R. E.: Am. J. Ophth., **20**:119-131, 1937.
6. Lancaster, W. B.: Tr. Sec. Ophth., A.M.A., 273, 1927; Surg., Gynec. & Obst., **52**:452-463, 1931.
7. Kirby, D. B.: Arch. Ophth., **25**:866-901, 1941.
8. Gifford, H., Jr.: Tr. Am. Ophth. Soc., **44**:435-492, 1946.
9. DeGross, E.: Arch. d'opht., **53**:161-165, 1936.
10. Dunphy, E. H.: J.A.M.A., **89**:2254-2257, 1927.
11. Greenwood, A., and Grossman, H. P.: Tr. Am. Ophth. Soc., **33**:353-361, 1935.
12. Gifford, S. R.: Illinois M. J., **68**:243-245, 1935.
13. Ferrer, H.: Am. J. Ophth., **9**:829 830, 1926.
14. Bothman, L.: Illinois M. J., **62**:243-246, 1932.
15. Lombardo, M.: M. Rec., **146**:251-253, 1937.
16. Ferrer, H.: Am. J. Ophth., **15**:324-327, 1932.
17. O'Brien, C. S.: Arch. Ophth., **1**:447-449, 1929.
18. Van Lint: Ann. d'ocul., **51**:420-424, 1914.
19. Klein, M.: Brit. J. Ophth., **30**:668-675, 1946.
20. Reese, A. B.: Am. J. Ophth., **31**:25-27, 1948.

CHOICE OF A MIOTIC AGENT FOLLOWING RETROBULBAR ANESTHESIA*

HAROLD G. SCHEIE, M.D., AND GAYLORD OJERS,† M.D.
Philadelphia, Pennsylvania

INTRODUCTION

For some years it has been the custom in the Department of Ophthalmology at the Hospital of the University of Pennsylvania to instill physostigmine as a prophylactic measure against iris prolapse following delivery of the lens from eyes in which intact pupils have been preserved. Because an occasional prolapse continued to occur in spite of this and other precautions, the pupils of several eyes were examined at various intervals during the first 24 hours after extraction.

A significant number of pupils, in eyes which had received retrobulbar and subconjunctival injections of procaine hydrochloride, were found to have remained dilated for several hours after operation. This persistent mydriasis was surprising in view not only of the instillation of physostigmine but also of the added factor of trauma during operation. The pupils had been dilated preoperatively by homatropine hydrobromide.

In searching for a possible explanation, the phenomena described in the denervated pupil by Anderson[1] in 1905 was recalled. He found that, following removal of the ciliary ganglion from cats, the pupils on the operated side dilated widely. He demonstrated that with complete denervation, following such removal, physostigmine was ineffective in constricting the pupil. Furthermore, the pupil constricted normally or more actively than normal to pilocarpine solution.

Loewi, Dale, and other workers[2] subsequently explained these phenomena when they evolved the neurohumoral theory of transmission of nerve impulses. In part, this theory postulates that a nerve impulse stimulates an organ to its physiologic action by a chemical substance called the effector substance. This is liberated by the terminal nerve fiber upon the arrival at that point of the nerve impulse. The effector substance liberated by the nerve endings of the parasympathetic nervous system, which include those supplying the sphincter iridis, is acetylcholine. Stimulation of a muscle cell to contraction involves a special apparatus called the myoneural junction, which consists of the terminal nerve fiber and the muscle cell which has a specialized area called the motor end-plate. Acetylcholine, liberated by the nerve ending, has a special affinity for the motor end-plate and through it stimulates the muscle cell to contraction. Relaxation of the muscle cell is brought about by cholinesterase, constantly present in the tissues, which rapidly destroys the acetylcholine.

The various miotic agents in common use clinically depend for their effect upon their ability to intervene in the myonueral junction in various ways. Pilocarpine produces miosis by mimicking the action of acetylcholine. Physostigmine, on the other hand, stimulates the sphincter muscle only indirectly. It inhibits or inactivates cholinesterase, thereby preventing the destruction of acetylcholine which now accumulates in concentrations sufficient to give continuous stimulation of the sphincter iridis with resulting miosis. Physostigmine, therefore, must have acetylcholine available to be effective, and acetylcholine is produced only by intact nerve endings. The removal of the ciliary ganglion or destruction of the ciliary nerves peripheral to this ganglion destroys the source of acetylcholine in the sphincter iridis. This renders physostigmine ineffective and explains its failure to constrict the pupils of the cats used in Anderson's ex-

* Presented at the 84th annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, May, 1948.

† From the Department of Ophthalmology of the Medical School and the Hospital of the University of Pennsylvania.

periments. On the other hand pilocarpine, which acts directly, as does acetylcholine, continues to be effective even after complete denervation.

It occurred to us that such a situation might account for the persistent mydriasis often seen in our patients following cataract extraction. A temporary postganglionic denervation of the sphincter pupillae might have resulted from the retrobulbar injection of procaine hydrochloride. This would of course render physostigmine ineffective when instilled postoperatively. The following experiments were therefore undertaken.

Outline of experiments

1. Observation of the effect of the retrobulbar injection of procaine hydrochloride upon the size and reaction of the normal pupil.

2. The effect of retrobulbar injections of procaine hydrochloride upon the pupillary response to miotic agents.

3. The effect of retrobulbar injection of procaine hydrochloride upon pupils previously rendered miotic by instillations of physostigmine or pilocarpine.

4. A comparison of the miotic effect of physostigmine and pilocarpine in overcoming homatropine and paredrine.

5. Determination of the most effective miotic agent for pupils previously dilated by retrobulbar injections of procaine hydrochloride and instilled homatropine or paredrine to simulate the clinical conditions encountered during cataract extraction under local anesthesia with retrobulbar procaine hydrochloride.

Methods of experiments

Unless otherwise stated, all experiments were carried out upon dogs anesthetized with nembutal. Ten eyes were used for each experiment. The term retrobulbar injection refers throughout to the injection of 2 cc. of 4-percent procaine hydrochloride. This was accomplished by rotating the eye upward with a fixation forceps and inserting the needle through the lower eyelid. If the retrobulbar injection was to be repeated, the syringe was detached and the needle left in place between injections. The miotic agents used were physostigmine (0.5 percent), and pilocarpine (1 percent and 10 percent), and one tenth of 1-percent di-isopropyl fluorophosphate. To insure adequate administration they were instilled twice, five minutes apart. All pupillary measurements were estimated by the use of a millimeter ruler. Figures given represent the average for the 10 eyes. Pupils were arbitrarily said to be miotic when 3 mm. or less in diameter.

Experimental data

Effect of retrobulbar injection of procaine hydrochloride on the normal pupil.

The pupils of nearly all animals dilated widely within 30 to 60 seconds after retrobulbar injection. Occasional failure to dilate was due to a poorly placed injection, since a second injection with the needle properly inserted resulted in prompt mydriasis. The pupils were fixed to light. The mydriasis was found to persist for an average time of 160 minutes after retrobulbar injection.

Effectiveness of pilocarpine and physostigmine following retrobulbar procaine injection.

1. The effect of retrobulbar injection of procaine hydrochloride upon pupillary response to miotics:

The miotic effect of physostigmine, pilocarpine, di-isopropyl fluorophosphate (D.F.P.) on pupils rendered mydriatic by retrobulbar injection was tested.

Pilocarpine (1 percent) was found to constrict the pupils to 3 mm. in an average time of 24 minutes, while pilocarpine (10 percent) had a similar effect in 20 minutes (chart 1). This time interval was shorter than that found in the normal eye of unanesthetized dogs not subjected to retrobulbar injection. The effect of physostigmine (0.5 percent) on the other hand, was markedly delayed (chart 1). Miosis oc-

curred, but only after a time interval of 80 minutes as compared with 40 minutes in the normal control animals. D.F.P. also produced miosis, but like physostigmine only after a significant delay, which averaged 120 minutes.

Physostigmine and D.F.P. therefore both became effective only after the effect of the retrobulbar injection began to wear off, a time previously found to be approximately 50 to 60 minutes following the injection.

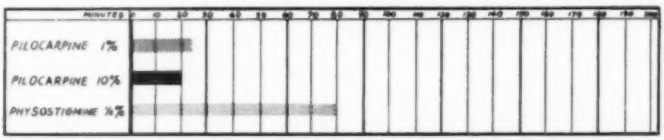


Chart 1 (Scheie and Ojers). Time required by pilocarpine and physostigmine to produce miosis in dog eyes with pupils dilated by retrobulbar injections of procaine hydrochloride.

After this interval, the pupils treated with physostigmine rapidly constricted. They became miotic twice as rapidly as the control eye which had had only a retrobulbar injection. These findings were compatible with those of Anderson and other workers with denervated sphincter muscle, and they indicated that a temporary ciliary ganglionectomy had been accomplished by the retrobulbar injection of procaine.

10 percent), and a retrobulbar injection was given. No dilatation of the pupil ensued. Similar experiments were done with pupils constricted by physostigmine or D.F.P. The physostigmine-treated pupils dilated almost immediately following the retrobulbar injection of procaine, while 9 of the 10 pupils constricted by D.F.P. dilated following retrobulbar injection. There was more of a lag as indicated by a time range of 1 to 8 minutes.

3. Clinical observations on the pupil following retrobulbar injections of procaine hydrochloride:

Some of the experiments just described in dogs were repeated upon patients who were being operated upon under local anesthesia, and the results were found to be similar. No drops except pontocaine hydrochloride (1 percent) were instilled locally. Retrobulbar injections were made contain-

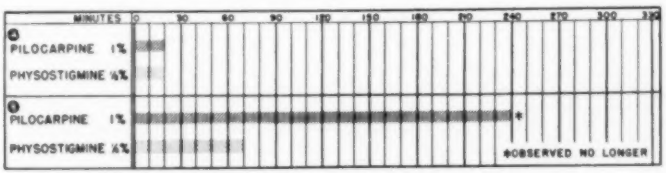


Chart 2 (Scheie and Ojers). Time required by pilocarpine and physostigmine to produce miosis in human eyes with pupils previously dilated by (A) paredrine and (B) homatropine.

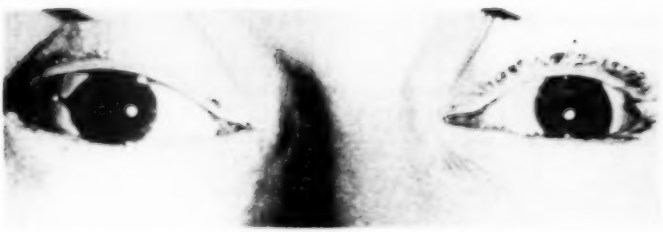
2. Effect of retrobulbar injection of procaine hydrochloride on pupils previously constricted by pilocarpine, physostigmine, or D.F.P.:

Miosis was produced in dog eyes by the instillation of pilocarpine (1 percent or ing 4-percent procaine hydrochloride. Adrenalin was not used either by instillation or injection. Several patients who were being operated upon for strabismus were given bilateral retrobulbar injections. Pupil dilatation was maximal in 40 to 50 seconds (figs.)

A

B

C



D

Fig. 1 (Scheie and Ojers). Photographs showing dilatation of pupils following retrobulbar injection of procaine hydrochloride and subsequent ineffectiveness of physostigmine. (A) Pupils prior to retrobulbar injection. (B) Mydriasis immediately following retrobulbar injection of procaine hydrochloride. (C) Pupils 15 minutes later, following instillation of physostigmine in the right eye and pilocarpine in the left eye. (D) Pupils 25 minutes later showing marked miosis from pilocarpine.

1A and 1B). Physostigmine (0.5 percent) was then instilled in one eye and pilocarpine (1 percent) in the other. Pilocarpine caused miosis which began in 5 minutes and was nearly complete in 20 minutes (figs. 1C and 1D). The pupils of several patients were then made miotic by instillations of physostigmine or pilocarpine prior to retrobulbar injections. Miosis was found to persist in the pupils constricted with pilocarpine, but those constricted by physostigmine promptly dilated.

Effectiveness of pilocarpine and physostigmine in constricting pupils previously dilated by homatropine or paredrine.

1. Pupils of 10 human eyes were dilated by two instillations of 1-percent paredrine five minutes apart. One-percent pilocarpine and 0.5-percent physostigmine were found to produce miosis with nearly equal rapidity (chart 2-A). Miosis of 3 mm. or less occurred within approximately 20 minutes.

2. Pupils of 12 human eyes were dilated by two instillations of homatropine (2 percent), five minutes apart. One-percent pilocarpine was then instilled and found to be quite ineffective in producing miosis. By the end of four hours, less than 1 mm. of contraction had occurred (chart 2-B). One-half-percent physostigmine, on the other hand, produced a miosis of 3 mm. in 12 human eyes after an average interval of about 70 minutes (chart 2-B).

Effectiveness of pilocarpine on pupils dilated by retrobulbar injections of procaine hydrochloride and the instillation of either homatropine or paredrine.

Having determined that pilocarpine, in contrast to eserine, produced prompt miosis in pupils dilated by retrobulbar injections, it seemed to be the miotic agent of choice following cataract extraction. However, because pilocarpine was relatively ineffective in counteracting homatropine dilatation, it was felt that paredrine would be the better agent for preoperative mydriasis whenever retrobulbar anesthesia was contemplated. The following experiments were performed to observe the effectiveness of pilocarpine in overcoming mydriasis produced by a combination of retrobulbar injection and homatropine or paredrine.

1. Because pupil dilatation was used as the criterion of a successful block, it was necessary to give the retrobulbar injection before instilling homatropine or paredrine. The needle was left in place as previously described to be sure subsequent injections were also properly placed. For some reason dog irides seemed refractory to homatropine and particularly to paredrine. Twelve instillations of one drop of 1-percent paredrine were instilled into each eye at 5-minute intervals to be certain that the mydriatic would be absorbed. Two hours from the initial drop, a second retrobulbar injection was

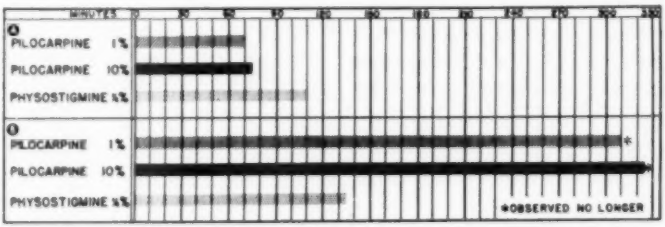


Chart 3 (Scheie and Ojers). Time required by pilocarpine (1 percent and 10 percent) to produce miosis in dog eyes with pupils previously dilated by retrobulbar injection of procaine hydrochloride and (A) paredrine or (B) homatropine to simulate clinical conditions during cataract extraction.

made through the previously placed needles, and pilocarpine (either 1 percent or 10 percent) was instilled twice at 5-minute intervals. Miosis resulted in an average time of 70 and 75 minutes for each strength solution respectively (chart 3-A).

2. Using the same routine, six drops of homatropine (2 percent) were substituted for the paredrine in another series of dog eyes. In these experiments 1-percent and 10-percent pilocarpine were equally ineffective in that no significant miosis had resulted with either strength solution at the end of 310 minutes (chart 3-B). The eyes were not observed further.

Discussion

Preliminary experiments with dog eyes showed that retrobulbar injections of procaine hydrochloride produced prompt pupillary dilatation of the ipsilateral eye. The pupil was fixed to light. These pupils responded to pilocarpine and eserine in a manner identical to that described by Anderson in animals from which the ciliary ganglion had been removed.

Prompt miosis was produced by the instillation of pilocarpine, but physostigmine was ineffective. Di-isopropyl fluorophosphate, which has physiologic properties similar to physostigmine, was likewise ineffective. The normal pupillary response of these drugs was regained after an average time of about 80 minutes at which time the effect of the retrobulbar injection of procaine had begun to wear off. Continued retrobulbar injection of procaine could prolong the mydriasis indefinitely.

Anderson in his experiments, however, found that physostigmine did not become ineffective for at least 24 hours after ciliary ganglionectomy; whereas, in our experiments with procaine this occurred within a period of seconds following the retrobulbar injection.

The explanation is obscure, but it seems likely that in Anderson's experiments the irritation of the severed nerves might have resulted in continued production of acetylcholine at the nerve endings. In the experiments with procaine, depression rather than irritation of the nerve fibers seemed likely. Acetylcholine was, therefore, no longer formed and physostigmine immediately became ineffective.

Experiments upon patients who were being operated upon under local anesthesia for strabismus gave similar results. Retrobulbar injections of procaine promptly produced mydriasis. Physostigmine was ineffective in producing miosis and remained so for 3 to 5 hours, but pilocarpine constricted these pupils normally. These experiments suggest that, in the presence of retrobulbar anesthesia, physostigmine is probably not the miotic agent of choice following cataract extraction.

Many surgeons believe the majority of iris prolapses occur during the first few hours after cataract extraction. During this immediate postoperative period the wound edges are very loosely coaptated and the anterior chamber probably forms and empties several times; meanwhile the aqueous tends to force the iris through the wound. Prompt postoperative miosis with retraction of the iris from the wound is therefore desirable, and from these experiments pilocarpine would seem to be the agent of choice.

Another factor which greatly influences the rapidity of postoperative miosis is the preoperative mydriatic agent employed. It is well known that the preoperative accidental instillation of atropine predisposes to iris prolapse because neither the trauma of operation nor miotics promptly constricts such pupils. For this reason homatropine and paredrine are the most commonly used preoperative mydriatics. We, therefore, tested the effectiveness of physostigmine and pilocarpine in counteracting homatropine and paredrine.

Pilocarpine was found to be quite ineffective in overcoming homatropine. Miosis had not occurred at the end of three hours.

Physostigmine produced miosis in such pupils in an average of 1¼ hours. On the other hand, these miotics were equally effective in overcoming mydriasis produced by paredrine. Such pupils were constricted within approximately 20 minutes by either substance. Because pilocarpine seemed to be the miotic of choice following retrobulbar anesthesia, we tested its effect following dilatation produced by combinations of retrobulbar injections of procaine and instillations of homatropine or paredrine. Prompt constriction of the pupils dilated by retrobulbar injection and paredrine occurred, whereas constriction occurred only after five hours when homatropine had been used. These findings would suggest paredrine should be employed rather than homatropine for preoperative mydriasis.

A miotic pupil is desirable throughout the corneoscleral trephining operation for glaucoma because it facilitates the performance of a peripheral iridectomy with the maintenance of an intact sphincter muscle. Experiments demonstrated that pupils constricted by pilocarpine remained undilated following the retrobulbar injection of procaine while those constricted by eserine dilated rapidly. Thus pilocarpine should be used preoperatively before a trephining operation, if miosis is to be maintained throughout the procedure when retrobulbar anesthesia is employed.

Retrobulbar injection of procaine hydrochloride, as suggested by Icaza[3] in 1946, has been employed in the treatment of acute congestive glaucoma. In view of the experiments just described, pilocarpine or some substance which acts similarly upon the myoneural junction should be used prior to the injection to avoid pupillary dilatation. Failure to do so, or the use of eserine alone, would result in wide mydriasis and possible aggravation of the glaucomatous state by further narrowing of the angle of the anterior chamber.

Conclusions

1. Retrobulbar injection of procaine temporarily produces an effect identical to the removal of the ciliary ganglion. The pupil is dilated and fixed and fails to constrict to eserine but does so promptly to pilocarpine.

2. Evidence therefore suggests that, if a miotic is to be employed following cataract extraction done under retrobulbar anesthesia, pilocarpine is preferable to eserine because eserine is rendered ineffective by the injection.

3. Paredrine is theoretically a more ideal preoperative mydriatic agent than homatropine because it is much more readily counteracted by pilocarpine. Although ordinarily a weak mydriatic, the retrobulbar injection of procaine adds to its effectiveness through paralysis of the sphincter pupillae.

4. If mydriasis is to be prevented following retrobulbar injection of procaine, particularly as used in the treatment of acute congestive glaucoma, pilocarpine should be used beforehand.

313 South 17th Street (3).

References

1. Anderson, H. K.: J. Physiol., 33:414-438, 1905.
2. Loewi, Dale, *et al.:* Cited by Cannon, W. B., and Rosenblueth, A., Autonomic Neuro-Effector Systems, New York, Macmillan, 1937.
3. Icaza, M. J.: Arch. Ophth., 35:361-365, 1946.

DEGREES OF CORRECTION PER MILLIMETER OF SURGERY*

RICHARD G. SCOBEE, M.D.
Saint Louis, Missouri

The title of this paper suggests little of interest for the orthoptic technician. It is the ophthalmic surgeon who should be interested in such a discussion. Unfortunately, many an orthoptist has been forced against her will into the position not only of saying when surgery should be done on a patient with heterotropia but also what operation should be done.

The blame for such a lamentable situation, when it exists and it is unhappily all too common, lies entirely with the surgeon. The oculist that is too lazy to delve into the intricacies of dysfunctions of the oculorotary muscles has no business attempting the surgical correction of such cases. There are many surgeons, however, who do exactly that.

A patient with crossed eyes will enter their consulting room. Their first step after refraction is to refer the patient to an orthoptist and then sit back and wait. The orthoptist will refer the patient back to the ophthalmologist's office at intervals during orthoptic training but nothing happens. It finally becomes obvious that the surgeon is going to do nothing until he is forced into it and the conscientious orthoptist will, therefore, usually suggest surgery when it is indicated. The surgeon usually agrees with surprising alacrity and will ask in an offhand manner for the orthoptist's opinion as to what should be done.

Make no mistake about this seemingly casual question for it is more frequently than not asked in dead earnest. Any suggestion that the orthoptist makes is usually followed to the letter. If the results are not good, the surgeon then blames the orthoptist rather than himself. If the results are good, he considers it a clever bit of surgery and often forgets the source of the advice. Actually, he has only himself to blame and he has taken an unfair advantage of the orthoptic technician and placed her in a very embarrassing position.

DIAGNOSTIC DIFFICULTIES

Every ophthalmologist who does surgery is confronted with one or more patients with heterotropia early in his career of private practice. Diagnostic procedures which seemed quite reliable during a residency quickly assume an alarming air of uncertainty in private practice when the responsibility for the case is his and his alone.

It is a simple matter to measure the number of degrees in the deviation of a patient with heterotropia. The problem is what to do once the amount of the deviation is known. It is an established fact that there are 360 degrees in a circle and that the circumference of the adult eyeball is in the neighborhood of 72 mm. If one divides 360 by 72, it will be found that each millimeter represents five degrees. The mathematical principle here is sound. However, the surgeon who expects to obtain 5 degrees of correction per mm. of surgery is doomed to many disappointments in dealing with the oculorotary muscles.

The young surgeon begins a search of the literature for some indication of exactly how much surgery to do when the heterotropia amounts to so-and-so many degrees. He will find some paper published on the subject with no great difficulty and will apply the figures given therein to his own case or cases. The results will be sometimes

* From the Department of Ophthalmology, Washington University School of Medicine, and the Oscar Johnson Institute. This is part of a study done under contract with the Office of Naval Research as Project N6onr-202, Task Order I, NR141-022. Presented at the seventh annual meeting of the American Association of Orthoptic Technicians, Chicago, October, 1948.

gratifying but more often bewildering and bitterly disappointing.

After one or two such unfortunate occurrences, he will begin to search the literature anew until he finds another paper on the subject. Here again, some authority is saying that for so many millimeters of recession he usually obtains so-and-so many degrees of correction. The young surgeon applies these new and, we might add, different figures to subsequent cases but again the results will be confusing.

The surgeon finally concludes that no one knows a great deal about the subject and consequently that he knows as much as anyone. His technique in dealing with patients with heterotropia is from that time onward a trial-and-error one and is far from satisfactory.

Averages misleading

There is one basic fallacy in all papers which report on "degrees of correction per millimeter of surgery" and it is that the figures given are always *averages*. Such averages can be, and usually are, highly deceptive.

A good analogy may perhaps be found in a survey, let us say, of wages in various small industries. One industry may employ 20 persons whose salaries range from $100 to $300 per month; the *average* wage in this industry might be $200 per month. Another industry, also employing 20 persons, might have two high-powered publicity men with salaries of $1,600 per month while the rest of the employees get no more than $150 per month; the *average* wage in our second example might be $260 per month.

The conclusion implied by a knowledge of only the average wage figure per month with respect to the actual incomes of the individual workers in the two industries is obviously false. In exactly the same way, average figures for the results of muscle surgery are prone to be deceptive.

No two cases alike

It is extremely rare to find two patients with heterotropia whose conditions are identical, and yet innumerable patients can be found who have, let us say, 30 degrees of esotropia. The point to be recognized and emphasized is this: the 30 degrees of deviation is not particularly important; much more important is *why* the 30 degrees of deviation are present.

About the only thing that any two patients, both having 30 degrees of esotropia, share in common is the degree of their deviation and even that may vary from time to time. From an intimate knowledge of only one of these cases, we can say little or nothing about the other. A lizard and an elephant have little in common except that they are both vertebrates. An intimate acquaintance with a lizard does not enable us to say anything intelligent about the elephant unless we have also seen and studied the elephant.

Admittedly there is nothing new nor particularly startling in the foregoing considerations. The mere realization that there is much variation between two patients with identical amounts of heterotropia is small consolation to the surgeon who is faced with the necessity of correcting the deviation surgically.

Considerations in planning surgery

There are a number of points to be taken into consideration in planning surgery in the patient with crossed eyes and no one of them alone yields sufficient information to enable an accurate decision to be reached. Let us review these considerations briefly.

1. Age. How old is the patient? The same operation on a child will usually result in far more correction than on an adult.

2. Duration. How long has the tropia been present? The same operation will produce more correction on a tropia which has been present for a short time than on one that has been present for a number of years.

3. How variable is the deviation? The patient whose tropia measures 10 degrees on one visit, 30 degrees on another visit, and 20 degrees on a third visit will show far more correction from the same operation than will a patient whose tropia measures 30 degrees on every visit.

4. Do glasses reduce the deviation? The same operation will produce more correction in a patient whose tropia is reduced by glasses, that is, in which there is an accommodative element, than in one whose tropia is affected not at all by glasses.

5. How large is the deviation? The same operation will produce more correction in a patient whose tropia measures 45 degrees than one whose tropia measures only 25 degrees.

6. Is there obvious paresis? A patient whose tropia is the result of a mild paresis combined perhaps, with other factors will show more correction following the same operation than will a patient whose deviation is solely the result of a severe paresis.

7. What is the near point of convergence? If the convergence near point is poor, that is, remote, in a patient with tropia, secondary convergence palsy is present. The immediate postoperative effect of a recession of the medial rectus muscle is much less in a patient with secondary convergence palsy than in one with no such palsy.

8. What degree of fusion is present? Even small amounts of second-degree fusion will appear to increase materially the correction effected by an operation in the patient with heterotropia. This is true for obvious reasons.

9. Which are the offending muscles? There is no substitute for an accurate identification of the muscle or muscles involved in the patient with heterotropia. One will occasionally hear a surgeon remark that ". . . it makes no difference which eye one selects for surgery in heterotropia because the two eyes are conjugated and work as a team." Actually, nothing could be farther from the truth. Surgical attack on the correct muscle will give far more correction than the same operation performed on an improper muscle.

10. Which is the dominant eye? The deviation which is present with the dominant eye fixing is the deviation at whose correction the surgeon must aim. This is true whether it be primary or secondary deviation, although it is imperative that the type of deviation be known. The same operation will go much farther toward correcting secondary than primary deviation.

11. Is the tropia monocular or alternating? The same operation will usually result in greater correction in the patient with monocular heterotropia than in one with an alternating type of deviation.

12. Is the tropia constant or intermittent? The same operation will have a greater effect in an intermittent heterotropia than in a constant one.

Problems at Operation

The points so far enumerated can be determined as easily by the orthoptist as by the surgeon. If these were all that mattered, the orthoptist would be perfectly competent to make detailed suggestions about the surgery to be performed in the patient with heterotropia. There are other factors to be considered, however—factors which can be properly evaluated only in the operating room. Let us consider them.

1. Effect of general anesthesia on the deviation. What happens to the deviation under general anesthesia? A patient whose esotropia disappears almost entirely or entirely under general anesthesia will show far more correction from the same operation than will a patient whose deviation is changed little if at all under the same circumstances. It should be stated here that the general anesthesia must be deep before the position of the eyes is evaluated; under shallow general anesthesia, esotropia often appears exaggerated while exotropia often seems to decrease in amount.

2. What are the results of the forced duction test? The forced duction test* may be used as an indicator, in the majority of cases, not of how much surgery to perform but of which muscles to attack. It should be obvious that the results of surgical attack on a primary offender will be greater than the same attack on a secondary offender. This point, which may seem vague, should be clarified in the next item for consideration. It does not refer to primary and secondary deviation.

3. What anatomic anomalies are present? The size, extent, and consequent significance of various anatomic anomalies found in connection with the oculorotary muscles in the patient with heterotropia should determine to a large extent the effect of surgery on these muscles. Anatomic anomalies frequently encountered are extra and thickened check ligaments, fused check ligaments, posterior check ligaments, foot-plate insertions, abnormal insertions, abnormal muscle slips, and abnormalities of the intermuscular membrane.*

4. Elasticity of the muscle. How elastic is the muscle which is being subjected to the surgical procedure? When severed from the globe, does it retract promptly into the orbit or does it retract slowly and incompletely? The greater the elasticity of a muscle, the greater the correction which will follow a recession of that muscle.

5. Size of the muscle. How large is the muscle? Recession of a large muscle will result in much more correction than recession of a small muscle for the same distance.

6. Operative technique. What is the technique of the surgeon? It might be thought that the operation of recession, for example, is a fairly well-standardized procedure. It is quite surprising, therefore, how many actual differences in technique may be found between two surgeons performing the same operation.

The surgeon who divides the check ligaments will get more correction than one who does not. The surgeon who severs the intermuscular membrane will get more correction than one who does not. The surgeon who finds and deals properly with anatomic anomalies will get more correction than one who does not. The surgeon who, inadvertently or not, strips the muscle of its sheath will get less correction than one who preserves it carefully intact. And yet both may be doing a recession operation.

Under the heading of operative technique should come the choice of the operation. Rather than attempting to perform many operations of different types and never performing any one procedure with a fair degree of skill, it is much wiser for the surgeon to practice one or two operations in order that he may master them. A perfectly suitable armamentarium is composed of one lengthening operation and one shortening operation. The recession and the resection will serve the average surgeon faithfully and well and neither is difficult.

7. Postoperative care. Immediate postoperative care in heterotropia is almost as important as is the operation itself. What might otherwise be a good result can be lost by lack of proper postoperative care. One is referring here to the use of atropine, glasses, orthoptics, or the prohibition of close work when any of these are indicated, either separately or in combination. The period of postoperative bandaging of the eyes is important with regard to the amount of correction to be obtained from the operation performed.

Comments

It is obviously impossible for the orthoptist to evaluate any of the points listed in the second group for the very excellent reason that she is nowhere near the operating room. Such a decision must be made by the surgeon himself on the operating table. This point has been recognized by such leaders as Jameson, White, Kirby, and Prangen in the past 25 years.

* Scobee, R. G.: Anatomic factors in the etiology of heterotropia. Am. J. Ophth., 31:781, 1948.

It is surprising how many surgeons are prone to ignore this latter group of points. They concentrate on the first group of findings and preoperatively formulate a rigid plan of procedure for the operating table—a plan from which they refuse to deviate one iota, irrespective of the findings at operation.

The situation is similar to that of a man who decides to drive to a neighboring community by a certain one of several possible roads and insists on taking that road even though he is told that the bridge has been washed out at the last minute. He is, of course, riding for a fall and deserves no particular sympathy.

It is not at all unusual to obtain as much as 25 or occassionally even 30 *degrees*—not prism diopters—of correction from a recession of a single medial rectus muscle in the patient with esotropia, provided the operation is properly done. On the other hand, a recession operation on the same muscle, when improperly performed, may yield no more than 4 degrees of correction.

With all of the points mentioned for consideration, two facts should by now be obvious. The first is that *average* figures for "degrees of correction per millimeter of surgery" are worthless. The second is that no two cases of heterotropia are alike and each must be treated on the basis of its own individual pecularities if the treatment is to be rational and thus successful.

The orthoptist can and should be a tremendous help to the surgeon in considering the first group of points, but he must consider the second group alone. It is distinctly unfair to the orthoptist if the surgeon seeks to force her to make suggestions about surgery when she cannot possibly know all of the important factors concerned prior to the actual operation itself.

Diagnosis and some forms of nonsurgical therapy may well be within the province of the orthoptist in handling cases of dysfunction of the oculorotary muscles. Surgical therapy for such conditions is in the province of the ophthalmologist alone. The orthoptist will readily agree with the latter fact. It is the surgeon who must be occasionally reminded of it.

640 South Kingshighway (10).

DISCUSSION OF DR. SCOBEE'S PAPER

WENDELL L. HUGHES, M.D.
Hempstead, New York

Dr. Scobee kindly sent me a copy of this timely, important, and constructive paper prior to his presentation. A great many points have been emphasized. Anyone who has read any of his papers must realize the background of research behind the opinions expressed. His opinions are not a rehash of opinions he has read or heard others express. They are an honest attempt to get at and present the truth. Whether all of his conclusions will bear the test of time, only time will tell.

For those of you who are liable to feel that it is the place of the orthoptic technician to advise as to how much of a shortening or lengthening procedure should be done in any specific case, it is well to bear in mind that there are a great many variables in the technique of the surgical procedures.

In a resection for instance, should one measure the distance from the front of the clamp to the position of insertion of the sutures through the stretched muscle as it is pulled forward at the time of insertion of the sutures or should one measure the unstretched muscle? The latter is obviously the

theoretically accurate measurement but it is the usual custom to measure the distance on the stretched muscle.

With this in mind, it is obvious that one is taking out more muscle tissue in a case where there is little stretching than in a case in which the muscle is weak and thin and stretches a great deal and, therefore, more correction will result in the case of the more rigid muscle from the same recorded amount of excision.

1. Where the forceps are applied to the muscle is a factor. There is a variation of a couple of millimeters in the location of choice of various surgeons. The portion anterior to the forceps is usually omitted from calculations. This portion retracts to the clamp as soon as it is severed. Some men will leave a millimeter or two of the tendon at the stump still attached to the eye, others will cut the muscle very close to the insertion.

2. The manner in which the sutures are placed and their number may cause variations. If the sutures are placed through the muscle and then the section of muscle cut off before pulling up the sutures, as in the original Reese technique, there will be a certain amount of longitudinal slipping of the sutures in the muscle and the effect will be only about two thirds of the effect produced by holding the muscle forward by the clamp and tying the sutures before excising the muscle section. Whether or not the same sutures are used to close the conjunctiva that are used in the muscle will account for some variation as compared to the technique where the conjunctiva is closed by a separate suture.

3. Whether or not the fascia is stripped entirely from the muscle is also a factor which was touched upon by Dr. Scobee.

4. In the recession operation many points of variation in technique will alter the results.

a. Whether or not a clamp is used to place the sutures and how far back in the tendon the sutures are placed, or whether or not the fascia is included or is stripped back from the tendon or widely severed, as Dr. Scobee has mentioned, will all affect the amount of correction.

Anatomic variations have already been covered by Dr. Scobee in this and other papers.*

You are all very familiar with functional analysis and many points have been mentioned by Dr. Scobee. When convergence excess is present a weakening of the muscles that have to do with convergence, prorated as to the convergence-divergence relationship, will produce the most satisfactory result. Usually, there is a combination of convergence overaction combined with underaction of the divergence function. Then a combined surgical procedure designed to weaken the muscles having to do with convergence and strengthen the muscles having to do with divergence is best. The amount of surgery to be done on one set of muscles will be prorated according to whether the findings are more abnormal on near or on distance fixation. If the findings are more abnormal at near range, the muscles having to do with active convergence (the medial recti) will be adjusted particularly.

Of course, when one runs across anatomic variations one must also take them into consideration in determining what and how much surgery to do.

One could continue for hours on a more or less futile compilation of the difficulties that beset the attending surgeon in cases of strabismus, but I believe more will be accomplished by the summary of some exemplary cases than in any other way.

In cases of convergence excess combined with a secondary divergence in sufficiency, with a moderate amount of latent hyperopia (over 1.500), and 20/30 vision or better with each eye, the following amounts of recession and resection are planned.

---

* Scobee, R. G.: Am. J. Ophth., 31:781, 1948.

With an esotropia of 35$^{\Delta}$ for distance and 45$^{\Delta}$ for near, which is reduced to 25$^{\Delta}$ for distance and 35$^{\Delta}$ for near by the use of a nearly full correction of the latent hyperopia present, I have been in the habit of doing first a recession of 4 mm. on one medial rectus and a resection of 5 mm. of the lateral rectus of the same eye.

The technique of the recession was to dissect the conjunctiva and fascia down to the tendon and sever the fascia along the muscle for about 12 mm. and to sever the check ligament as well. One double-armed, 3-0 catgut suture was looped transversely over the central fibers at a point about 2 mm. back from the actual insertion and then the tendon was cut off at the insertion. The needles were then inserted into the outer one third of the sclera at a point 4 mm. back from the insertion.

Strictly speaking this is a recession of only about 3 mm. when the extra amount of tendon in front of the suture is considered and allowance is made for the slight amount of slipping of the suture longitudinally in the fibers of the muscle.

The conjunctiva was then closed with a separate continuous mattress 5-0 catgut suture.

The lateral rectus was likewise cleaned and the check ligament cut. Then a resection forceps was applied to the muscle about 2 mm. back from the insertion. The muscle was then cut off leaving about 0.5 mm. of tendon as a stump. The muscle was then stretched moderately forward and the central needle of a triple-armed suture* was passed from without in through the muscle 5 mm. back from the front of the blade of the resection forceps and then passed forward to the insertion stump.

The end needles of the suture were then passed through the respective margins of the muscle at the same distance back from the blade of the forceps and then passed through the margin of the tendon stump. The suture was then cut at the position of the central needle thus making two sutures. The muscle was then pulled forward and the stump pulled back so there would be no longitudinal slipping of the suture in the muscle. Each suture was then tied, pulling the muscle tightly to the tendon stump. Then the muscle was cut transversely in front of the sutures and the conjunctiva united by a continuous mattress 5-0 catgut suture.

If, in the above case, there had been 45$^{\Delta}$ of esotropia for distance and 60$^{\Delta}$ for near, I would have chosen to do a similar recession of 4 mm. and a resection of 7 mm. If more effect is needed an additional recession of 3.5 to 4 mm. on the medial rectus of the other eye would be done.

These figures may serve as a guide, if the above mentioned technique is followed. One could continue this discussion for days but I think that the points that Dr. Scobee has brought out are particularly important. This discussion is specifically prepared from the surgical standpoint since you are all quite familar with the orthoptic points which he has brought out.

131 Fulton Avenue.

* Lisman, J. V.: A triple-armed suture for resections. Am. J. Ophth., 31:466, 1948.

THE CLINICAL ASPECTS OF SYMPATHETIC OPHTHALMIA*

HAROLD H. JOY, M.D.
Syracuse, New York

There is evidence that sympathetic ophthalmia was recognized nearly 1,000 years ago, but its first accurate description was given by McKenzie in 1840. Although a vast amount of clinical and experimental investigation has been carried on during the past century, its pathogenesis is still unsolved. Consequently, there is no method of determining individual susceptibility or of ascertaining the imminence of its onset, and there is no specific therapy for its prevention or cure. Attempts to produce the disease experimentally and to find an offending organism have been unsuccessful. The two most generally accepted pathogenic theories are that it is produced by an exogenous infection or that it is the result of an allergic reaction to uveal pigment, or that both processes are involved.

INCIDENCE

Its occurrence is relatively infrequent with an estimated general incidence of about 0.15 percent of all eye diseases and an incidence of 1 to 2 percent of all perforating injuries. It may occur at any age and, although it is most frequent in children, their particular susceptibility has not been proved.[1] Males are much more frequently affected than are females, probably due to their greater exposure to injury.

It has been suggested that certain individuals have an acquired or hereditary sensitivity, and that others, such as Negroes who are rarely affected, have an immunity. Several authors have commented on the rarity of sympathetic ophthalmia in arid climates and have noted the greater likelihood of its occurrence during the wet and cold seasons. For some reason, during times of war, the incidence is lower in the armed forces than in the civilian population. This has been ascribed to the prompt and proper care of eye injuries of the military personnel, to their better physical condition, and to the possible prophylactic value of the various sera which all receive. It has been stated on numerous occasions that the incidence of the disease has decreased in recent years. However, a review of the literature of the older writers, in which all manner of varieties of ocular inflammation have been diagnosed as sympathetic ophthalmia, indicates that the decrease is more apparent than real.

PREDISPOSING CAUSE

The predisposing cause is almost always a perforating wound involving the ciliary body or the root of the iris, particularly if there is incarceration of uveal tissue or lens material. In such cases the wound does not heal promptly, and the danger of late infection is added to that of immediate contamination and uveal constriction. On the other hand, perforating wounds of the cornea, with a nonprotruding iris prolapse anterior to the limbus, and clean, promptly healing wounds of the sclera behind it, are relatively safe. As a rule, large limbal wounds offer more danger than small ones, since they remain open longer and the uveal prolapse is apt to be more extensive. Strangely enough, sympathetic ophthalmia rarely follows the spontaneous rupture of corneal ulcers. In these cases, the inflammatory reaction produces a fibrinous exudate which soon seals off the exposed area.

The disease seldom occurs unless there is a frank opening in the globe. However, it may follow nonperforating trauma or, more rarely, a disintegrating melanoma of the uvea. In either case there is almost always a subconjunctival scleral rupture, and it is possible that the offending agent enters the

* Read before the New York Society for Clinical Ophthalmology, October 6, 1947.

eye through minute abrasions of the conjunctiva, or that it penetrates the uninjured conjunctiva.

The presence of pyogenic bacteria in the globe lessens the hazard of sympathetic involvement by tending to destroy the uveal tissue and whatever is the causative agent. However, it does not provide insurance against its occurrence for some uveal tissue may be retained and, as the globe becomes phthisical, it may become a potentially exciting eye.

About 85 percent of cases result from perforating wounds, and about 65 percent are accidental.[2] The nature of the object causing the injury is relatively unimportant so long as an iridocyclitis is produced. An analysis of 436 proved cases of sympathetic ophthalmia showed that 20.9 percent were attributed to intraocular operations.[3] This relatively high incidence is understandable in view of the fact that most operations involve the iris, and many also involve the lens. Moreover, as the presence of inflammatory or degenerative changes possibly increases the danger, cataract and glaucoma may be of some importance as predisposing causes.

Although it is occasionally impossible to discover an extenuating circumstance to account for postoperative sympathetic inflammation, it is probable that some such cause is frequently present. This was found to be true in 58 percent of 44 confirmed postoperative cases which I studied.[3] In some cases a predisposing pathologic process was found in the exciting eye preoperatively, in others an accident occurred during the operation or shortly afterwards, while in some a second operation was performed. De Grosz[4] has called attention to the fact that repeated operations add to the danger of sympathetic involvement.

Cataract extraction is the most common predisposing cause of postoperative sympathetic ophthalmia. Statistics are not available to show how much of this is due to the frequency of cataract operations, and how much is due to any particular danger of the condition. Extracapsular extraction offers more danger than if the lens is removed in its capsule, because of the greater likelihood of delayed wound healing as a consequence of incarceration of uveal tissue or lens material.

Another important predisposing factor is the development of phaco-anaphylaxis caused by retained lens cortex in the anterior chamber. This is probably the most frequent cause of sympathetic ophthalmia after discission of congenital cataracts.

Although the intracapsular method of extraction obviates the danger caused by lens material, the necessarily large incision favors the occurrence of iris prolapse which, after all, is the most important element in producing sympathetic disease.

Glaucoma operations would seem to offer a favorable field for the development of sympathetic inflammation. For most of the operations which have been devised to relieve intraocular pressure permanently expose the uvea to infection, while the inclusion operations offer the added hazard of iris incarceration.

It has been frequently stated that sympathetic disease does not often follow iridectomy, for generally the operative trauma to the ocular tissues is not marked, iris prolapse is infrequent, and a keratome incision heals promptly and securely. However, three cases followed iridectomy in my series.[5]

Although the deliberate incarceration of the iris seems contrary to good surgical procedure, iris-inclusion operations have become increasingly popular in recent years because of their efficacy in reducing intraocular pressure. Surprisingly enough, it does not appear to be a frequent cause of sympathetic ophthalmia. However, some ophthalmologists have abandoned its use because of this danger. Its substitution by trephination lessens somewhat, but does not eliminate, the hazard; and it offers the added possibility of late pyogenic infection and subsequent loss of the globe.

So long as a glaucomatous eye remains

hard after operation, the chance of sympathetic involvement is remote. However, the very low postoperative tension that sometimes follows may not always be due to filtration, but may be the result of postoperative iridocyclitis. Such a globe is approaching atrophy and may be the precursor of sympathetic inflammation.

Cyclodiathermy and operations for retinal detachment do not favor the development of sympathetic ophthalmia, for the uvea does not prolapse. The reaction causes the openings to close almost immediately and the tissues tend to shrink away from the wound because of their elasticity.

Incubation period

One of the most confusing aspects of this disease is the extreme variability in the interval between injury and the onset of inflammation in the fellow eye. Apparent authentic cases are on record in which this interval ranges from a few days to as long as 49 years. However, in the vast majority of cases, the incubation period extends from 1 to 3 months, with the greatest incidence occurring during the second month. There is usually little to fear after three months have passed, and practically no danger after one year. The diagnosis should be scrutinized closely if the fellow eye becomes affected in less than 14 days after injury or if the interval is greater than one year. Close study of many cases with an apparent extremely long incubation period will show some extenuating circumstances, such as a more recent second injury or operation.

Clinical picture in injured eye

Although there is no characteristic clinical picture in the injured eye to give warning of the onset of sympathetic inflammation, there is usually more or less evidence of the likelihood of impending danger. Eyes which should be viewed with most suspicion are those which, after a penetrating wound involving the ciliary body or the root of the iris, are followed by a prolonged low-grade uveitis which is resistant to treatment and is subject to occasional exacerbations with a tendency to recurring ciliary pain and to phthisis. The danger is in close proportion to the incidence of prolonged inflammation.

On the other hand, the injured eye may give little or no indication that sympathetic ophthalmia is threatening, for the type and degree of inflammation which may be present is almost limitless. It may exhibit the clinical signs of a severe acute traumatic uveitis, or those of a mild inflammatory process that is apparently subsiding without complication. Although the inflammatory signs may be slight, careful examination will show evidence of congestion, for it is always present when sympathetc uveitis appears.

Once sympathetic ophthalmia has started, the congestion in the exciting eye increases and, according to Irvine,[6] runs a parallel course, with exacerbations and remissions occurring coincidentally in the two eyes.

Clinical picture in sympathizing eye

Sympathetic ophthalmia may originate posteriorly in the choroid, but it almost always appears first as a mild iritis which gradually develops into a prolonged plastic uveitis, characterized by massive cellular reaction, and subject to exacerbations and recurrences. The iris soon becomes thickened and rigid and more and more resists dilatation. In spite of comparatively mild inflammatory symptoms, exudation is marked, and there is early and persistent development of posterior synechias, and gradual secondary involvement of all the ocular tissues.

With the exception of defective vision the subjective symptoms are notable for their mildness. Ciliary tenderness may be present throughout the course, and pain may occur as the result of an accompanying scleritis or of secondary glaucoma.

The onset is insidious without premonitory signs. Dimness of sight is almost always the first symptom and is usually due to a mild serous cyclitis. Examination at this time reveals bedewing of the corneal en-

dothelium, a few posterior corneal precipitates, and slight clouding of the aqueous. According to Irvine,[6] the corneal precipitates appear in this eye before or simultaneously with their occurrence in the exciting eye. Within a day or two, ciliary congestion can be observed, the iris shows slight furring, a few fine posterior synechias can usually be seen, and the disc is frequently blurred. At the outset, the vitreous is usually clear, but small opacities soon appear and rapidly increase in number, causing a generalized cloudiness and, later, disintegration.

Meanwhile, the inflammation in the anterior segment has continued to progress. The corneal precipitates increase in number, the aqueous becomes more turbid, and the posterior synechias further develop, tending to produce seclusion or occlusion of the pupil. Even if there is partial mydriasis, peripheral adhesions may form, binding the entire posterior surface of the iris to the lens, which shows early capsule clouding and frequently later cataract formation. At this stage the iris has a muddy, velvety appearance and the stroma loses its fine details. Woods[1] describes a characteristic change which usually appears not earlier than the second month in which the iris and lens capsule become almost confluent, with vessels from the iris invading the pupillary membrane.

The media usually become so cloudy after a few weeks as to obscure fundus details. But in arrested cases, small yellowish lesions of chorioretinitis are sometimes seen scattered about the periphery. The intraocular pressure is often reduced and the globe may become very soft but usually some degree of glaucoma occurs as the result of the posterior synechias or of the increased protein content of the intraocular fluids. If this is not relieved, vision is destroyed and phthisis bulbi follows.

Fortunately, early and well-directed treatment usually checks the progress of the inflammation before vision is destroyed. And occasionally there are mild cases which seem to recover regardless of treatment. However, the course is usually long drawn out, characterized by exacerbations and relapses, and lasting 9 or 10 months in the well-treated and favorable cases, and sometimes extending for years in those which progress to blindness.

Diagnosis

The clinical diagnosis cannot be made with absolute certainty since the picture in the exciting eye is not characteristic and may be masked by the results of trauma and infection; and symptoms identical with those found in the sympathizing eye can be due to other causes. The various serologic diagnostic aids, which have been advocated from time to time, have not proved constant; hence, the presumptive diagnosis must be made by ophthalmic signs alone.

The diagnosis will be more likely the more closely the case fulfills the following conditions: (1) The presence of uveal inflammation in the injured eye caused by exogenous infection, particularly if there is inclusion of uveal tissue or lens matter in the wound. (2) A reasonable interval (usually 2 to 3 months) between injury and the onset of inflammation in the fellow eye. (3) The presence in the fellow eye of the rather characteristic plastic uveitis with early development of keratic precipitates. (4) Proof that this inflammation is not due to some other cause such as focal infection, syphilis, sarcoid, or tuberculosis. While a presumptive diagnosis may thus be made, the only means of making a positive diagnosis is by histologic examination of uveal tissue.

Prophylaxis

Sympathetic ophthalmia is much easier prevented than cured. The salient prophylactic measures comprise prompt and proper treatment of accidental perforating wounds, correct procedures in intraocular surgery, and particularly if the progress is not satisfactory, careful and repeated slitlamp studies of both eyes until all danger has passed.

Above all, it is of paramount importance to remove the injured eye promptly if indicated.

Evisceration is not an effective prophylactic measure, probably because of the occasional retention of uveal tissue. Owing to the possiblity of extraocular extension of the process, the enucleation should be done freely, including removal of the muscular insertions and as much of the optic nerve as possible. On the assumption that potentially active material may still be left behind, Samuels[7] has suggested postoperative radiation of the socket.

Although no definite criteria for prophylactic enucleation can be laid down, there are certain rules which, if followed, will lessen the danger of sympathetic ophthalmia. Hopelessly injured eyes and those with vision destroyed by suppuration should be promptly removed. It is also usually advisable to remove blind eyes resulting from old injuries, and even those with light perception but with faulty projection, for they are potentially dangerous. This is particularly true if they are subject to recurrent ciliary congestion and lowered intraocular pressure.

As a rule, prophylactic enucleation is contraindicated if there remains any degree of vision. However, if vision is reduced to light perception in the injured eye and is good in its fellow, enucleation may be indicated in the following conditions: (1) In patients who cannot be controlled. (2) If there is marked ciliary tenderness and low intraocular pressure persisting for as long as three weeks after injury. (3) In extensive wounds involving the ciliary body accompanied by uveal and vitreous prolapse, if not seen within 24 hours after the injury, and in which there is little hope of useful vision.

Sympathetic ophthalmia can always be prevented if the injured eye is removed before the appearance in it of the specific pathologic changes, and it can usually be prevented if removed before such changes occur in the fellow eye. Hence, the shorter the interval between injury and enucleation the greater the prophylactic value. Removal of the exciting eye within two weeks after injury almost always prevents sympathetic involvment, but further delay lessens or nullifies the favorable effect.

If sympathetic inflammation does not follow within two weeks after enucleation of the exciting eye, the chance of it occurring is slight, and it almost never occurs after one month. However, because of the fact that it may appear after a longer interval, it is advisable to make repeated slitlamp studies of the fellow eye for a considerable period after removal of a suspected eye.

If the onset of sympathetic ophthalmia is feared, the pupil of the uninjured eye should be fully dilated in anticipation of inflammation, systemic treatment started, and daily examinations made with the slitlamp.

Treatment

To be at all effective, treatment must be started early, and it must be thorough. It is quite generally agreed that enucleation of the exciting eye has little or no favorable effect after sympathetic uveitis is once established. However, cases are occasionally reported which tend to refute this opinion. So, until it has been definitely proved ineffectual, a blind exciting eye or one with grossly faulty projection should be promptly removed, at least in early cases. On the other hand, if it offers any hope whatever of retaining or regaining any degree of vision, it must not be sacrificed, for in the end it may be the better eye.

Practically all that can be done in treating the sympathizing eye is to attempt the establishment of maximum mydriasis. This is usually most difficult, due to extensive posterior adhesions, and to a lesser extent the rigidity of the iris. The development of secondary glaucoma, while potentially very serious, need not necessarily cause undue alarm since, as a rule, the sympathizing eye withstands increased intraocular pressure

fairly well. In many mild cases, particularly if due to increased protein content of the intraocular fluids, the period of hypertension is brief and subsides during the continued use of mydriatics. In others, repeated corneal paracenteses may tide over the acute phase. Any surgical measure involving the uvea should be postponed if possible, for it is notoriously sensitive to operative interference.

No form of systemic treatment has proved entirely adequate. The use of massive doses of salicylates and nonspecific foreign-protein therapy, particularly in the form of diphtheria antitoxin, appear to be the most effective, especially if supplemented by desensitization through uveal pigment. The intravenous injection of arsenicals, tuberculin therapy, and autoserum therapy have many advocates, but have proved of doubtful value. The sulfonamides and penicillin have, on the whole, been most disappointing; and it is yet too early to assess the value of streptomycin.

Because of the devastating nature of the disease, its uncertain etiology, and the lack of a truly adequate form of treatment, there is a tendency to use too many therapeutic agents and to use them excessively. This not only results in confusion of values but may lower resistance to the specific infection. "Shot-gun" treatment must therefore be avoided.

Since the course of the disease is long drawn out and debilitating, the bodily resistance should be aided in every possible way. A complete physical and serologic examination is mandatory, and proper attention must be given to any abnormalties, with particular attention to foci of infection. Bed rest is essential during the inflammatory episodes, and hospitalization is necessary until well after complete subsidence of inflammation in favorable cases, and only when all hope is abandoned in those with an unfavorable outcome. After hospital discharge, repeated follow-up examinations with the slitlamp are most important, for recurrences and exacerbations are characteristic of the disease.

Even in successfully treated cases the battle with sympathetic ophthalmia is not always won with the subsidence of inflammation, for cataract and glaucoma are frequent complications or sequelae. No conditions tax the judgment and skill of the ophthalmic surgeon more, for while the exciting eye tolerates operations well, the sympathizing eye is extremely sensitive even after a long period of quiescence. This sensitivity may often be reduced by uveal-pigment therapy or by injection of diphtheria antitoxin before the operation. If surgical intervention is necessary, it should be done with a minimum of trauma, particularly to the uvea. Except in a grave emergency, it is advisable to delay the operation for at least one year after all signs of inflammation have disappeared.

Prognosis

The prognosis of sympathetic ophthalmia is always uncertain, chiefly because of variation in degree of severity, the reasons for which are unknown. Many authors have maintained that generally the course is unusually severe and the outcome less favorable in children and after cataract extraction. However, there are too many variable factors present to ascribe importance to any particular type of case. The prognosis is viewed today with much more optimism than in former years, principally because of the earlier recognition of the disease and to a better understanding of the importance of starting treatment promptly. Indeed, the most important prognostic factor over which we have control is the early institution of prompt and proper therapy.

The statistics of various authors indicate that a favorable prognosis may be expected in two thirds of the cases in which therapy is prompt and adequate. The results of my studies would seem to bear this out, for useful vision resulted in 73 percent of the patients for whom treatment was started within two weeks of the onset, compared

with 37.5 percent in those for whom it was delayed for one month or more.[2] Unfortunately, a great many patients are not seen until the disease is well advanced, and the outcome in these cases is likely to be unfavorable in spite of all treatment. Considering all cases, vision of 20/200 or better may be expected in a little over one half.

504 State Tower Building.

REFERENCES

1. Woods, A. C.: Am. J. Ophth., **19**:9, 1936.
2. Joy, H. H.: Arch. Ophth., **14**:733, 1935.
3. ———: New York State J. Med., **36**:85, 1936.
4. De Grosz, E.: Tr. Ophth. Soc. U. Kingdom, **46**:271, 1926.
5. Joy, H. H.: Arch. Ophth., **17**:677, 1937.
6. Irvine, R.: Arch. Ophth., **24**:149, 1940.
7. Samuels, B.: Tr. Am. Ophth. Soc., 1933.

ARIBOFLAVINOSIS

WITH A CASE REPORT ON PARENCHYMATOUS KERATITIS FOLLOWING RIBOFLAVIN DEFICIENCY

B. K. DAS GUPTA,* M.B.
Calcutta, India

It is barely eight years now that riboflavin has attracted the attention of the ophthalmologists of the world. Since the publication of the paper by Sydenstricker, Sebrell, Cleckley, and Kruse[1] in which they described the ocular signs of ariboflavinosis in man, several workers in different parts of the world attributed different types of lesions of the eye either to riboflavin deficiency or to vitamin-B–complex deficiency. Up until now, no clear-cut picture of ocular manifestations due to riboflavin deficiency has been made out and it is clear that, as the years go by, with the advancement of knowledge, reports of various types of ocular manifestations, which will be attributed to riboflavin deficiency, will pour in.

The components of the vitamin-B–complex group probably act as synergists. In the series of cases described by Sydenstricker, nicotinic acid, thiamin chloride, ascorbic acid, and cod-liver oil were added to the diet in order to make the deficiency of riboflavin a dominating one. Ocular signs may be noticeable before the disorders make their appearance.

Subjective symptoms, such as photophobia and dimness of vision, seem to appear first and on examination circumcorneal injection is seen. The description given by Sydenstricker and others is: "The earliest change that can be recognized with the slitlamp is marked proliferation and engorgement of the limbic plexus with the production of great numbers of very narrow capillary loops which outline the extreme margins of the scleral digitations and obliterate the narrow avascular zone between the plexus and the sclerocorneal junction. . . . Such capillaries lie just beneath the epithelium and soon anastomose to form a tier of loops from which more single capillaries arise, extending centripetally."

Bessey and Wolbach[2] showed that ocular signs of ariboflavinosis could be produced experimentally in rats, and pointed out that the earliest detectable sign is corneal vascularization. Some observers include congestion or engorgement of the normal loops in this category, and Gregory[3] pointed out, in 1943, that there was no discrimination in the literature between a full limbic plexus and an actual invasion of the cornea by new vessels.

Mann[4] says that it would be unwise to include the full limbus among signs of riboflavin deficiency, the earliest certain signs of which would seem to be a budding out

* Professor of Ophthalmology, Medical College, Calcutta.

of new capillaries from the limbal loops at their apices, with extension on to the true cornea.

McCreary, Nicholls, and Tisdall[5] photographed the sclerocorneal junction with the ophthalmic camera and found that the results obtained were not significantly different from slitlamp examination of the corneoscleral junction. Out of 41 individuals studied, who had been provided with a ration containing 2.9 mg. of riboflavin per day for a period of one year, 50 percent were given a supplement of 3.3 mg. of riboflavin three times a day for two months. They did not find any consistent change in corneal vascularization in either the treated subjects or the controls.

Day, Langston, and O'Brien[6] reported on the clinical manifestations in experimental animals on diets deficient in riboflavin. These mainly consisted of alopecia around the eyelids and excessive lacrimation. Pappenheimer reported on the histologic examination of the cornea of one of these rats and found "a very slight keratitis and some newly formed blood channels."

Day, Langston, and O'Brien reported, in 1931, on ocular changes in 37 rats fed on a diet deficient in riboflavin. They found anterior interstitial keratitis in 100 percent and cataract in 94 percent. Microscopic examination revealed an inflammatory process in the anterior stroma. The epithelium was normal but there were subepithelial small lymphocytic and leukocytic infiltrations accompanied by new blood-vessel formation.

In 1935, Bourne and Pyke,[7] in similar experiments, were able to produce cataract in only 31 percent of the animals after a period of 79 days on the diet, and they stated that the most consistent ocular sign was "superficial keratitis," which occurred in 92 to 100 percent of the rats within 70 days.

Das Gupta,[8] in 1943, described a case of parenchymatous keratitis following riboflavin deficiency. In his case the endothelium of the cornea and deeper parts of the substantia propria of the cornea were affected, but there was no new vessel formation at the sclerocorneal junction which invaded the cornea. The patient was given 4 mg. of riboflavin daily and the whole cornea cleared up in 29 days.

Cosgrave and Day,[9] in 1942, reported on 28 patients with corneal diseases treated with riboflavin. The results varied considerably. Cases of interstitial keratitis associated with hereditary syphilis responded much more rapidly when riboflavin was administered along with antisyphilitic treatment than when the antisyphilitic treatment alone was given.

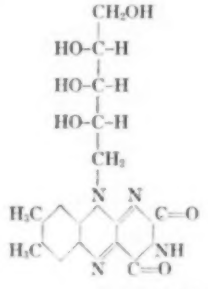
Sebrell and Butler[10] described in detail the general signs of ariboflavinosis in man. The lips may become abnormally red and cracks may appear at the angles of the mouth. There is seborrhea and follicular keratosis of the forehead, malar and chin eminences. The tongue shows signs of glossitis and there may be fissuring of the tongue.

Johnson and Eckhardt,[11] in 1940, reported that rosacea keratitis improved with riboflavin therapy; whereas, recently Fish[12] has contradicted the statement. Karunakaran and Nair[13] described a condition of the skin of the scrotum, in which it becomes dry and scaly and causes considerable itching in cases of riboflavin deficiency along with the eye and mouth lesions (oro-oculo-genital syndrome).

Chemistry and physiology of riboflavin

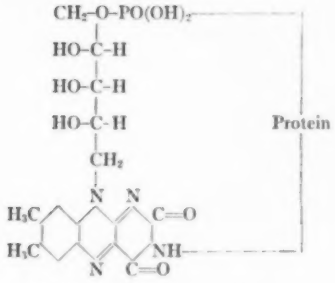
Riboflavin has long been known to be combined with phosphoric acid and a protein to form Warburg's yellow enzyme (Johnson).

A.



A. Riboflavin

B.



B. Warburg's yellow enzyme

Sydenstricker, Kelly, and Weaver[14] maintain that riboflavin, nicotinic acid, and thiamin are the reactive components of several co-enzymes necessary for the fractional dehydrogenating process, which results in the utilization of energy from carbohydrate. Riboflavin is also necessary for intracellular respiratory processes and, like other vitamins, is supposed to be present in every living cell.

It is believed that, if hemin substances are not present in a tissue (for example, avascular cornea), the oxidation within the cell is accomplished by Warburg's yellow enzyme. A deficiency of riboflavin seriously impairs the intracellular oxidative process. Proliferation of capillaries from the limbic plexus seems to be an attempt to combat localized anoxemia by bringing hemin substances into close proximity with the tissues. When riboflavin is administered in sufficient amounts, regression of the proliferated capillaries occurs.

Occurrence of riboflavin in the body

Riboflavin occurs largely in a free state in secretions such as milk and urine. In tissues it occurs in a combined state with adenylic acid, a phosphate group and a specific protein, most of which do not fluoresce. Prolonged dialysis may release riboflavin from tissues but this is probably due to breakdown of flavoproteins. Estimation of riboflavin depends either on its property of fluorescence, a method described by Najjar,[15] or on the microbiologic method, as worked out by Snell and Strong,[16] that depends on the growth rate of certain bacteria, which varies with the concentration of riboflavin in the medium. The Snell and Strong method of estimation is the one of choice, at the moment, for it enables an accurate estimation of very small amounts of riboflavin. It has been estimated that an adult man requires about 3 to 5 mg. of riboflavin per day.

Case report

History. P. C. B., a Hindu businessman, a native of Howrah, was seen on October 30, 1947. He gave the history of a slight redness in the right eye followed by gradual loss of vision during the last five months. He was seen by several eye specialists of Calcutta, who gave him atropine drops for his right eye along with milk injections. Wassermann and Kahn tests were negative but still he was given a course of arsenic and bismuth, and to no effect. His vision was very much reduced and he said that his eye was getting worse day by day.

On examination, the right eye showed slight circumcorneal injection. There was slight watering from the affected eye. The photophobia was of moderate degree and there was slight ptosis.

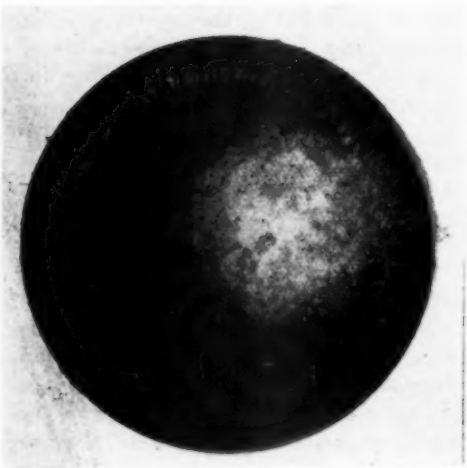
Except for a small rim at the periphery on the temporal side, the cornea was grayish white. There was no encroachment of the limbic plexus on to the cornea. The opacity was almost homogeneous. No keratic precipitates were seen. Vision was 1/60 in the right eye. In the left eye, vision was 6/6 and the fundus was healthy.

On slitlamp examination, it was found that all of the cornea except the epithelium was densely infiltrated. No blood vessel was seen. There were no keratic precipitates. The endothelium was very ragged in outline. Infiltration was much more dense in the posterior part of the stroma than in the anterior part.

General examination. The patient was rather thin but looked quite healthy otherwise. He lived on an average Bengali diet

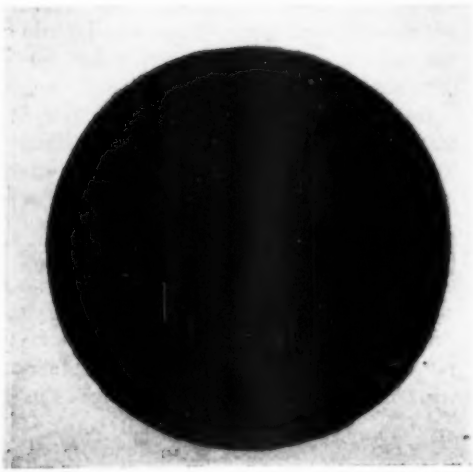
FIRST STAGE

SECOND STAGE



THIRD STAGE

FOURTH STAGE



FIFTH STAGE

Fig. 1 (Das Gupta). Drawings showing the appearance of the eye at various stages during riboflavin treatment. (1st stage) Before treatment was started. (2nd stage) 12 days later after 120 mg. of riboflavin had been administered. (3rd stage) 30 days after treatment was started and after the administration of 300 mg. of riboflavin. (4th stage) After the administration of 520 mg. of riboflavin—at the end of 52 days of treatment. (5th stage) 65 days after treatment was started. 650 mg. of riboflavin had been administered.

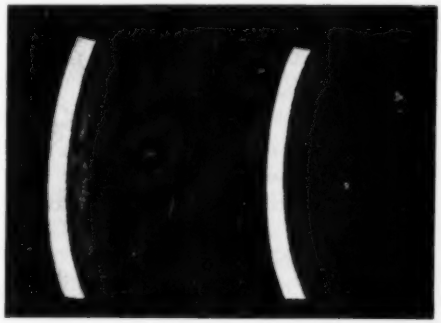
consisting mainly of rice, dal, fish, and vegetables. There were no other signs of ariboflavinosis—no angular stomatitis, glossitis, fissuring of tongue, or scurfiness of the skin of the scrotum.

Treatment. Locally, atropine ointment (1 percent) was applied once every day. He was advised to put on dark goggles. One ampule of Beflavin (Roche) containing 10 mg. of riboflavin was injected intramuscularly every day.

After about 12 injections (120 mg. of riboflavin), the patient showed signs of improvement. The photophobia and epiphora were much less and the corneal haziness looked less dense. Beflavin was continued and, after about 25 injections (250 mg. of riboflavin), the opacity started to clear from the periphery. The patient was given 78 injections (780 mg. of riboflavin) before the whole cornea cleared up. The central part of the cornea was last to clear.

Before the cornea had cleared up completely, the central opacity became fragmented. If anyone had seen the case at this stage, he would have mistaken it to be an old case of superficial punctate keratitis. I personally gave the injections and watched the progress of the case from day to day.

The patient now has a normal cornea, possibly a bit thinned, and his vision is about 6/9.



Before Treatment After Treatment

Fig. 2 (Das Gupta). Slitlamp appearance of the eye before and after treatment.

Summary

1. General ariboflavinosis is reviewed with special reference to ocular manifestations.

2. A case of parenchymatous keratitis, which improved markedly with riboflavin given parenterally as the only therapy, is described.

3. Notable features of the case are that there was no abnormal growth of blood vessels from the limbic plexus on to the cornea and that all the layers of the cornea except the epithelium were involved.

Medical College Hospitals.

I am grateful to the superintendent of the Medical College Hospitals, Calcutta, for allowing me to publish this interesting case report and to the artist of the Eye Infirmary, Medical College Hospitals, Calcutta, Mr. A. Das Gupta, who so carefully painted the pictures, in subsequent stages, which are published herewith.

References

1. Sydenstricker V. P., Sebrell, W. H., Cleckley, H. M., and Kruse, H. D.: J.A.M.A., **114**:2437, 1940.
2. Bessey, A. O., and Wolbach, S. B.: J. Exper. Med., **69**:1, 1939.
3. Gregory, M. K.: Brit. M. J., **11**:134, 1943.
4. Mann, I.: Am. J. Ophth., **28**:243, 1945.
5. McCreary, J. F., Nicholls, J. V. V., and Tisdall, F .F.: Canad. M.A.J., **51**:106, 1944.
6. Day, P. L., Langston, W. C., and O'Brien, C. S.: Am. J. Ophth., **14**:1005, 1931.
7. Bourne, M. C., and Pyke, M. A.: Biochem. J. **29**:1865, 1935.
8. Das Gupta, B. K.: Indian M. Gaz., **78**:198, 1943.
9. Cosgrave, K. W., and Day, P. L.: Am. J. Ophth., **25**:544, 1942.
10. Sebrell, W. H., and Butler, R. E.: Pub. Health Rep., **54**:2121, 1939.
11. Johnson, L. V., and Eckhardt, R. E.: Arch. Ophth., **23**:899, 1940.
12. Fish, W.: Brit. J. Ophth., **27**:107, 1943.
13. Karunakaran, C. O., and Nair, P. K.: Indian J. M. Research, **28**:371, 1940.
14. Sydenstricker, V. P., Kelly, A. R., and Weaver, J. W.: South M. J., **34**:165, 1941.
15. Najjar, V. A.: J. Biol. Chem., **141**:355, 1941.
16. Snell, E. E., and Strong, F. M.: Indian-Eng. Chem. Ann., **11**:346, 1939.

FURTHER STUDIES IN AMBLYOPIA

J. B. Feldman, M.D.
Philadelphia, Pennsylvania

In a previous paper,[1] I suggested a new device for an easier, as well as more rapid, treatment of amblyopia. Since that time, more experience has been gained both in the use of the instrument and in the phenomena of amblyopia.

Ordinarily the great majority of cases with refractive errors but with normal fundi are corrected by glasses. By comparison the amblyopic cases are few, and these patients are instructed to use either a patch or a mydriatic to the good eye depending on the extent of the refractive error. Unfortunately these instructions are not always rigorously adhered to, and the treatment is discontinued by the patient until the time for the next refraction. When the patient returns after 1 or 2 years for reëxamination and shows a persistently poor monocular vision, the previous tentative diagnosis of congenital amblyopia naturally appears verified, and little more attention is paid to the amblyopic eye.

Undoubtedly amblyopia is a condition far more prevalent than is ordinarily realized. With the aid of the telescopic amblyoscope, one can easily arrive at a prognosis. This will eliminate undue hardship in that the eye need not be patched continuously, and will relieve the examiner of embarrassment because the treatment was not effective anyway.

Associated with amblyopia there may often be a muscular imbalance, suppression, abnormal correspondence, and some or all of these together, with or without strabismus. As a result of these, or possibly independent of these obstacles, there may be a psychologic background, the correction of which may materially affect the improvement or cure in a number of cases.

Treatment

Briefly the initial examination consists in taking the vision on four or more different Snellen charts, including the vision through the telescopic amblyoscope. If the latter instrument shows normal vision for the amblyopic eye,* treatment is suggested. An orthoptic examination should be made in order to recognize all the obstacles present. An attempt is then made to correct these obstacles at the same time. The visual acuity is corrected to the best vision obtainable.

Lessons on the telescope are given once a week, with daily lessons for work at home. Twelve lessons are given followed by a month's rest period to assure the permanency of the visual improvement. The patch and some exercises may be used during this rest period. If, on return, the case is not entirely improved, but an examination by the telescopic amblyoscope shows a possibility of further improvement, another course of treatment is suggested. Ordinarily two courses of these treatments have proved beneficial; rarely, are more advisable.

The recession of a line on the Snellen chart on return after the rest period is no bar to further treatment provided the reading on the telescopic amblyoscope approaches normal vision.

It should be remembered that just the attainment of normal vision in an amblyopic eye is not sufficient. The permanency of good visual acuity is assured only when good duction is firmly established, and thus fusion with amplitude is gained. For this reason, associated orthoptic training is necessary.

Observations

Amblyopia associated with suppression

Ocular, like auditory suppression is a condition often found in normal individuals.

It was interesting to observe what part, if any, suppression played in the presence of

* The instrument is more valuable for prognosis in children than in adults.

amblyopia or in delaying cure when treatment was instituted.

Suppression is not an ever-existing obstacle in severe amblyopia, even though one might expect this to be so.

One of my cases will, I believe, illustrate this fact. H. N., aged eight years, with a visual acuity of: O.D., 20/30; O.S., 20/200, took three series of treatments (over a year's treatment including rest periods). Her final vision was: O.D., 20/20; O.S., 20/30. Never during any lesson did she show the slightest evidence of suppression.

On the other hand suppression may be persistent, and yet the patient with amblyopia may have the vision improved in spite of this obstacle. An outstanding case was B. B., aged 32 years. Vision was: O.D., 20/50; O.S., 20/20. She obtained normal vision in five lessons, although she had strong suppression. She could not be persuaded to return for treatment of suppression, a condition of which she was not actually aware.

There were 42 cases of amblyopia, each of which had suppression only. Their ages ranged from 4 to 60 years. Sixteen, or 39 percent, obtained normal vision. In some of these cases, the suppression cleared. Among these, 39 percent of the cases, the suppression varied from mild to alternating to absolute. A number of cases took 2 courses of 12 treatments each with an interval between treatments of one month.

Of the 61 percent of uncured cases, 9 patients had absolute suppression, and the balance varied, like the visually corrected amblyopics, between mild and alternating.

Vertical imbalance associated with amblyopia

Any form of muscle imbalance may be asymptomatic, and an individual may also have normal visual acuity of both eyes in spite of either vertical or horizontal muscle imbalance.

Of the various types of muscle imbalance, possibly the only one likely to retard improvement in amblyopia would be the vertical imbalance. White and Brown[2] have called attention to the fact that disregard of the study of the vertical imbalance in a case of squint may result in an unsuccessful operation. Refractionists have seen a number of alternating squints with normal vision in spite of the deviation present.

During the time that the cases of amblyopia were studied, it was interesting to observe that actual improvement in vision came to those patients who, during their treatment, acquired good duction.

The following is corroborative evidence, I believe, that hyperphoria plays a small role, if any, in either the causation of, or as a deterrent factor in the cure of amblyopia.

Hyperphoria can be observed in several types of patients: (1) Those with normal visual acuity and who are asymptomatic; (2) those who attain normal vision and yet have symptoms of muscular asthenopia, such as pain in the eye, dizziness, nausea, and so forth; (3) cases of hyperphoria in squint with normal vision; (4) cases of hyperphoria in squint associated with poor vision.

1. Hyperphoria can be present in normal visual acuity as illustrated in this one case. A patient, T. R. S., aged eight years, with a vision of 20/20 of both eyes, came to be refracted. She was examined on three different occasions. There was present during her examination a hyperphoria of between 3 to 9 prism diopters, with alternating suppression. Her vision was normal and, therefore, she did not require glasses.

2. How little hyperphoria influenced either the causation or retardation of visual correction is demonstrated by the case of M. S., aged 28 years, who suffered a great deal as a result of her vertical imbalance. She had a left hyperphoria of between 5 and 8 prism diopters, and she wore prisms prescribed for her by several ophthalmologists. Her vision was always corrected to normal in spite of her hyperphoria.

3. In cases of normal visual acuity, even in hyperphoria with strabismus, the patient

does not suffer from interference with his vision because of a vertical imbalance. T. A., aged eight years, had an alternating squint of 45 prism diopters. During her orthoptic treatment, her hyperphoria varied from 4 to 14 prism diopters. She even had cyclophoria. In spite of all this, her vision was always normal.

While treating the amblyopic patients, five patients were treated for the improvement of their strabismus. They all had normal vision in spite of the fact that their vertical imbalance ranged up to 13 prism diopters.

4. Hyperphoria in squint associated with poor vision.

There were nine patients of this type whose ages ranged from 6 to 16 years, and who had vertical imbalances of from 4 to 13 prism diopters. Their squints ranged to 70 prism diopters. Their vision improved in spite of the hyperphoria present.

In a few other cases which might have been included in this group but were not, there was abnormal correspondence. In these cases, to be reviewed later, the vision did not improve, more likely on account of the abnormal correspondence than the hyperphoria.

Strabismus associated with amblyopia

When strabismus is associated with amblyopia there are usually also present other obstacles such as muscle imbalance, suppression, and so forth. These cases were divided into two groups for evaluation: (1) Those with normal correspondence; (2) Those with abnormal correspondence.

1. Normal correspondence. There were 22 cases of squint with normal correspondence. Their ages varied from 4 to 44 years. In some cases the squint was as low as 6 to 8 prism diopters* and in others ranged up to 25 prism diopters. Nine patients obtained full correction in spite of the associated obstacles. Of the remaining 13, 5 patients showed no improvement whatever; a few might have improved, but they stopped treatment for one reason or another. Among the patients who did not improve, was 1 with vision of 20/200, and 3 with visions of 20/70.

In the group of improved cases, 2 patients had 20/100 vision and 3 had 20/70 vision in the amblyopic eye. The remaining few had almost the same visional range distribution as the uncured cases in those cases of squint with abnormal correspondence.

2. Abnormal correspondence. In this group the ages ranged from 4 to, in several cases, 46 years. The highest angle of squint was 80 prism diopters, yet several squints were as low as 4 prism diopters. One patient had vision as low as 5/200; another, 20/300; 4 had 20/100 vision; and vision in the other cases was between 20/70 and 20/40 for the amblyopic eye.

There were 35 cases of abnormal correspondence. Nine obtained normal vision. Of the 26 cases who did not get well, 5 had a resulting vision varying from 6/200 to 20/200. It is questionable whether the few patients who did show improvement could ever definitely obtain normal vision and, if they should obtain normal vision, whether the cure would be permanent.

Not any of these patients had normal vision on the telescopic amblyoscope on their first or any other examination, so that little hope was expected for these cases from the very beginning. A number of these cases were given 3 or 4 series of lessons, but with no final cure.

Amblyopia associated with divergent squint

There were 4 cases of divergent squint in the group treated; 2 of these cases, with the angle of squint up to 15 prism diopters, were improved to normal.

In the other 2 cases the results were not so good. The angle of squint was 30 prism diopters for each.

*For the purpose of uniformity, all measurements were on the synoptophore and are given in prism diopters.

One of these patients, W. E., aged 6 years, had 20/200 vision in the left eye. He took three series of lessons, but vision never improved beyond 20/70. He had a low grade anisometropia.

The other case, H. S., aged 17 years, had an alternating suppression with a hyperphoria up to 5 prism diopters on occasion. Her original vision in the poor-seeing eye improved from 20/50 to 20/40 + 3. She also took three series of lessons. On several rechecks at bimonthly intervals, her vision showed a tendency to recede.

Nystagmus with its associated amblyopia

Nystagmus is included in this group only because of the high refractive error in these patients. One could hardly expect amblyopic treatment to improve the visual acuity in a case of nystagmus; there was, however, one exception. The patient had a lateral nystagmus. He came to see me 2½ years ago at which time vision was: R.E., 20/200; L.E., 20/50. He obtained one series of treatments with vision in both eyes improved to 20/40. He returned in five months for a check-up, and the vision was the same. He was not heard from for two years; he then returned because the teachers complained about the poor work he was doing. His vision was 20/70 for both eyes.

A course of treatments was given with resulting vision of 20/40 for the right eye and 20/30−4 for the left eye. Unfortunately it is impossible to get a true measure of his fixation. However, he feels better and does better work in school, as observed by the teachers.

In the four other cases, the patients claimed that their vision "cleared" and that they felt more comfortable.

Psychologic examination and treatment

When, in the course of treating cases of amblyopia, it was noted that some cases made little progress because of psychologic difficulties, I referred 12 of my patients for psychologic examination and treatment. Four of these cases have shown marked improvement in their amblyopic exercises. These amblyopic cases and others to be added will be reported at a later date.

Taking of fields and visual acuities

A number of fields and visual acuities on at least four different test charts were taken on each patient.

The fields, taken in the main on a tangent screen, varied from large central scotoma, to fleeting suppression scotoma of various dimensions, to various-sized scotomas peripherally in the 10- to 30-degree area. A few cases even had a clear-seeing central field up to as far as 10 to 25 degrees, beyond which they did not see.

When such bizarre fields are found for amblyopia, one questions their validity. It is to be remembered that, in the main, the patients are children who, when examined, are apprehensive, and do not give exact findings.

In reviewing the amblyopic records, it was learned that the visual acuities were taken on the most common Snellen charts: (1) Illiterate (E) charts; (2) letters on white charts; (3) numbers on white charts; (4) white letters on black charts. When taking visual acuities with Snellen charts, there may be a personal element involved. Some patients read letters more easily, others numbers. In a majority of the cases, the visual acuity was somewhat less with the number chart than with the other Snellen charts.

Anisometropia associated amblyopia

The frequency with which one sees anisometropia in amblyopia is well known. In my cases, 63 patients had an anisometropia of more than 1 diopter; 25 had an anisometropia up to 1 diopter.

It was interesting to observe, in reviewing several thousand records taken at random from my files, that 68 patients had anisometropia and 20, a milder form; that is, a varia-

tion in refraction of up to 1 full diopter. All these were amblyopic.

In addition to this number, there were 49 patients with anisometropia among 2,000 patients. Not a single one of these 49 patients had amblyopia, showing that anisometropia, unless of high degree, is not the sole cause of amblyopia.

The degree of anisometropia or the vision present were not always indications as to whether the case would not respond to treatment. Some cases with a high visual error improved faster then those with better vision, and the same was true in anisometropia.

Summary

A review of 108 cases of amblyopia is given; 36 (32 percent) were cured.

Directions are given for the use of the telescopic amblyoscope as a prognostic instrument and for the treatment of amblyopia.

Obstacles are diagnosed by orthoptic examination.

To obtain permanency of the improved vision in an amblyopic eye, it is important to obtain, in addition to the improved vision, fusion with amplitude. Vision should be rechecked on a number of occasions for a number of months.

Suppression, muscle imbalance, squints with or without normal correspondence are discussed as to their relative importance in the causation or delay of cure of amblyopia; excepting the cases of congenital amblyopia which are always incurable.

Anisometropia and squint with abnormal correspondence, or amblyopia with a high angle of squint, may be instrumental in either the causation, the prolongation, or failure of cure in amblyopia.

It appears that if the adult past the age of 45 years and the conditions just mentioned are excepted, there is some hope for the amblyopic.

With the telescopic amblyoscope, or some such devise, a prognosis for the case can be given, especially for a child. The telescope has an added advantage—that of being used in treatment.

Poor visual acuity (less than 20/200) is not always an indication of a poor result. A patient with a visual acuity of, for example, 20/40 in some instances has no better assurance of improvement than another patient with vision of 20/70 or 20/100. The same is true of anisometropia. Amblyopia with a very low degree of anisometropia may sometimes take longer to cure than when a slightly higher degree of the same condition is present.

37 South 20th Street (3).

References

1. Feldman, J. B.: Arch. Ophth., **34**:494, 1947.
2. White and Brown: Arch. Ophth., **21**:999, 1939.

CLINICAL EVALUATION OF D.F.P. IN GLAUCOMA THERAPY*

MORGAN B. RAIFORD, M.D.
Atlanta, Georgia

Since its introduction for the treatment of glaucoma, D.F.P. has proved a most potent anticholinesterase drug and a powerful miotic. Its action is quite prolonged and, according to Scholz and Wallen in their studies in normal human eyes, signs and symptoms of its spasm of accommodation and miotic effects varied from 3 to 7 days following a single instillation.

D.F.P. in the concentration of 0.05, 0.1, and 0.2 percent produces blurring of the vision, headache which may be over the eye, or orbital discomfort. Spasm of accommodation and pericorneal injection are frequently encountered. McDonald stated that the ciliary spasm and occasional rise in tension following its administration apparently is the result of arteriolar dilatation and an action of the drug upon the ciliary body. In the concentrations already mentioned, it produces its greatest number of undesirable symptoms during the first few days of its use. Because of these effects, there has been a tendency to discredit the use of D.F.P. in the clinical care of glaucoma patients. In the toxicologic studies reported, no dangerous side reactions have been noted when the concentrations usually given in glaucoma cases have been administered.

Leopold and Comroe reported two instances in which a rise in intraocular pressure followed instillation of D.F.P. In one of the cases, an iridectomy was required before the tension fell spontaneously.

In the 82 patients with 122 glaucomatous eyes, reported by McDonald, 57.4 percent had a tension of lower than 30 mm. Hg (Schiøtz). In McDonald's series, 0.1-percent D.F.P. was used in daily instillations. He also noted that the correct dosage must be determined for each patient.

The use of D.F.P. (0.05 percent) following intracapsular cataract extraction through a round pupil and in cyclodialysis is recommended by Lebensohn as a miotic of choice at the conclusion of surgery.

PRESENT STUDY

Since D.F.P. has such prolonged action and is a most capable antagonist of cholinesterase, a series of 22 patients with 42 glaucomatous eyes were studied, using varied concentrations of the drug. The period of investigation covered a period of 10 months.† The patients, with two exceptions, had had glaucoma for a period of from 10 months to 9 years.

When first used, D.F.P. (in each case 0.05 percent or 0.1 percent in peanut oil) was instilled as one drop at bed time every night. This was continued for 2 to 4 weeks, and the effects as to signs and symptoms were recorded. The D.F.P. was then discontinued for a period of 4 to 6 weeks, during which time miotics previously used were given. Then D.F.P. of lesser concentration was used, 0.01 percent and 0.005 percent in peanut oil), one drop being instilled nightly at bed time. This was continued for the remainder of the 10 months of observation with the exception of two cases.

Of these exceptions, one patient was found to be sensitive to peanut oil (Case 20), and another (Case 17) was probably refractory to the drug and was returned to 5-percent pilocarpine which was instilled 5 times a day in each eye.

SURVEY STATISTICS

In this series of 21 patients with 41 glaucomatous eyes, the age varied from 39 to 84

* From the Department of Ophthalmology, Graduate Hospital of the University of Pennsylvania. The D.F.P. (Di-isopropyl fluorophosphate) for this study was furnished by the Medical Division, Merck & Co., Rahway, New Jersey.

† Begun October, 1947.

TABLE 1

TABULATED CLINICAL FINDINGS WITH ADMINISTRATION OF D.F.P. IN THE TREATMENT OF GLAUCOMA

No.	Name	Age	Type and Duration of Glaucoma	Vision	Intraocular Pressure with Previous Miotics			Previous Therapy	Visual Fields	D.F.P. Administration	Length of Observation	Intraocular Pressure with D.F.P.			Visual Fields	Comment
					Lowest	Highest	Average					Highest	Lowest	Average		
					(mm. Hg Schiøtz)						(Months)	(mm. Hg (Schiøtz)				
1	E.H.	78	Chronic simple (1942)	O.D. 6/12 O.S. blind	19	34	22	Pilocarpine 2% gtt.i, t.i.d.	O.D. within 20° central.	0.1% slight pain and ciliary reaction 1 wk. 0.01% no reaction.	8	19	13	17	No change	More comfortable with 0.01% H.S. gtt.i., O.D.
2	A.S.	67	Chronic simple; diabetic; O.D. aphakic	O.D. 1/60 Aphakic. O.S. 6/12	17 18	38 36	20 22	Pilocarpine 3%; Eserine ¼% O.U. t.i.d., gtt.i	O.D. 13 central. O.S. 25° central.	0.1% pain in eyes. 0.01% no reaction.	9 9	22 19	15 14	18 17	No change No change	Comfortable 0.01% gtt.i., O.U., H.S.
3	M.D.	54	Chronic simple; corneoscleral trephination—O.D. 1942, O.S. 1943; allergic.	O.D. 6/60 O.S. light perception.	12 19	29 61	17 40	Pilocarpine 3%; Eserine ¼% q.i.d. gtt. i, O.U.	O.D. 5° central. O.S. light perception.	Began with 0.01% H.S. gtt.i, O.U.	5 5	18 36	11 24	16 26	No change No change	0.01% very satisfactory, holds tension lower, less fluctuation.
4	R.D.	51	Chronic simple,(1942); corneoscleral trephination, O.D. 1944.	O.D. 6/6 O.S. 6/6	19 17	37 29	24 21	Pilocarpine 2% gtt.i, t.i.d. O.U. and occasionally Eserine ¼%.	O.D. & O.S. maintained central 15–20° past 3 years.	0.05% H.S. gtt.i for 2 wks. Then to 0.01% D.F.P. H.S. gtt.i, O.U.	8 8	25 26	17 17	19 19	No change Slight increase.	Slight increase of tension first 4 days with little headache. D.F.P. free interval of 5 wks. and began 0.01% with no symptoms.
5	W.E.	71	Chronic simple (1939); trephination, O.D. 1941, O.S. 1944; cataract surgery, O.D. (1948); O.S. (1947).	O.D. 6/12 O.S. 6/15+2	13 After trephination 15 After trephination	31 35	19 20	Pilocarpine 2% gtt.i, 5× daily O.D., 3× daily O.S.	Decrease in superior O.D. 25° central O.S. since trephination	0.1% D.F.P. gtt.i. H.S. caused pulling sensation in eyes. 0.01% no reaction gtt.i, H.S., O.U.	9 9	26 17	15 12	17 14	No change No change	D.F.P. free interval for 6 wks. changed to 0.01%. No reaction.
6	W.G.	60	Chronic simple (1941) O.U.; O.D. surgery (1943) and cataract surgery O.S. (1947).	O.D. 6/30 O.S. 6/12	11 After trephination 17	48 34	19 19	Pilocarpine 2%; Eserine ¼% 4× daily gtt.i O.U.	O.D. field stabilized since trephination. O.S. contracted.	0.1% caused blurring vision and aching for 1 wk.	8	24 22	16 16	19 18	Slight increase No change	10 days of 0.1% D.F.P., stopped for 4 wks. Began 0.01% D.F.P. No reactions.
7	E.H.	55	Cataract surgery O.D. and O.S. (1944); O.S. vision went bad 1 yr. later; optic atrophy now. Pain in eyes for 2 mo.	O.D. 6/9+1 O.S. hand movements	21 41	29 59	23 44	Pilocarpine 2%; Eserine 1%, gtt.i t.i.d. O.U.	O.D. 12° central. O.S. hand movements	Began with 0.01%. No reactions. No change O.S. when reduced ×1 daily.	6	26 41	19 28	20 32	No change No change	Fluctuations in tension better controlled with D.F.P. more than once daily did not change tension O.S.
8	S.G.	39	Noted pain O.S. Feb. 1948, more at night; O.D. occasional aching; chronic simple, wide angle.	O.D. 6/6+2 O.S. 6/5	22 24	32 30	27 26	Pilocarpine 1% gtt.i, t.i.d. Had pain at night in both eyes.	Increase relative scotoma about blindspots. Decreased in 2 wks. after miotics.	0.1% H.S. Some blurring of vision. 0.02% then used, gtt.i, H.S., O.U.	5 5	26 29	18 22	22 23	Slight decrease	Decrease in central fields. Advised trephination. Wants to continue D.F.P. More even tension.
9	M.S.	65	Chronic simple (1943); trephination—O.D. 1943, O.S. 1944.	O.D. 1/60 O.S. 6/12	11 after trephination 11 after trephination	78 30	17 22	Pilocarpine 2% gtt.i, t.i.d., O.U.	O.D. 5° central. O.S. 12° central.	0.1% no reaction other than few days of blurring vision. 0.01% kept tension down as well. H.S. gtt.i., O.U.	10 10	22 24	15 19	17 20	No change No change	Just prior to D.F.P. % tension O.U. up. 0.01% H.S. O.U. gtt.i. acts well in controlling.
10	G.G.	84	Cataracts (1939); O.D. operated (1940), O.S. (1941); glaucoma (1942) postoperative.	O.D. light perception O.S. 6/15	14 15	40 40	26 24	Pilocarpine 2%; Eserine ¼% gtt.i., t.i.d. O.U. since 1942.	O.D. light field 10°. O.S. 7° central.	0.1% caused slight aching O.D. No symptoms O.S. 0.01% no symptoms.	5	27 26	21 20	22 22	No change No change	0.01% holds tension evenly. Reduced to 0.01% after free interval of 2 wks.

11	C.W.	66	9/18/47 chronic simple, seen because pain in eyes and blurring of vision	O.D. 6/9+1 O.S. 6/9+3	21 21	35 32	29 23	Pilocarpine 2% gtt.i., t.i.d. O.U.	O.D. 3° contracture central. O.S. 11° central.	0.1% caused pain in eyes. No rise in tension. Changed to 0.01% after 16 days.	10 10	29 26	19 19	21 21	Slight decrease No change	Patient hypertensive, mentally slow. D.F.P. keeps tension more stable. Less administration each day aids patient.
12	M.A.	69	Followed since 1942, chronic simple, cataracts, no surgery desired.	O.D. 1/60 O.S. 1/60	19 22	44 50	26 30	Pilocarpine 2% gtt.i., t.i.d. O.U. Eserine ¼%. Not too regular with miotics.	Light fields peripheral 40–50° all meridians.	0.05%, no symptoms. 0.01% holds tension just as well.	7 7	25 29	17 19	19 22	No change No change No change	By miotic once daily, patient finds more convenient. D.F.P. controls tension better at lower level.
13	J.S.	77	Removal cataract O.D. (1927), O.S. (1930) with vascularization of cornea (1937).	O.D. 6/15 O.S. 6/60	17 13	30 35	21 22	Pilocarpine 2% gtt.i., t.i.d. O.U.	O.D. 25° central O.S. 3° central.	0.05% gtt.i. H.S. Slight blurring O.D. 0.01% holds tension equally well. No reaction.	10 10	35 22	17 13	19 22	Slight improvement in central field	Beta radiatioon O.D. for vascular cornea. Tension higher than (Jan. 1948). Lower afterward.
14	A.P.	58	Chronic simple (1945) O.U.	O.D. 6/12 O.S. 6/2	17 17	48 29	22 22	Pilocarpine 2%; Eserine ¼% gtt.i. t.i.d., O.U.	O.D. 25° central, enlarged blind spot. O.S. 15°	0.1% blurring symptoms. 0.01% no symptoms.	9 9	22 21	17 19	19 19	Slight increase O.D. O.S. no change.	0.01% kept tension same level with less fluctuation.
15	B.S.	54	Chronic simple—O.D. narrow angle, O.S. old old iridocyclitis (1941).	O.D. 6/9+4 O.S. blind	17 35	35 78	24 48	Pilocarpine 2%; Eserine ¼%, gtt.i., t.i.d., O.D. Prostigmine 5% and Mecholyl 5% did reduce O.S. tension.	10° central O.D. Blind O.S.	0.05% headache and blurring, O.D. for 10 days .01% no reaction.	10	24 48	15 35	22 42	No change	After reducing to 0.01% no complaints and no change in tension level. Decreases fluctuation.
16	B.H.	64	Chronic simple (1/15/45); O.D. trephination (1946); diabetic.	O.D. 6/22 O.S. 6/9−2	13 13	35 29	18 20	Pilocarpine 2% gtt.i., t.i.d. O.U.	O.D. 20° central . O.S. Rönne step 15° field.	0.1% blurring of vision. 0.01% no reaction.	9	22 29	17 21	19 22	No change	0.01% no reaction. Tension variation less.
17	J.W.	53	Chronic simple O.S. (1942); Loss O.D. trauma.	O.D. enucleated O.S. 6/15	— 11	— 55	— 21	Pilocarpine 5% 5× daily O.S.	O.S. 5° field.	0.01% gtt.i. H.S. O.S.	1	56	28	37	No change	Stopped. Patient probably refractory to.. D.F.P. Did best on 5% pilocarpine.
18	W.W.	70	Old keratitis O.S. (1921); senile cataract and chronic simple O.D.	O.D. 1/60 O.S. 6/30	15 17	25 29	22 21	Pilocarpine 2% gtt.i., t.i.d. O.U.	O.D. light perception. O.S. depression lower half.	0.1% headache. Blurring O.S. 0.01% no reaction.	10	26 26	19 19	22 21	No change	0.01% gtt.i., H.S., O.U. lessened tension variation. Beta radiation O.D. corneal vascularization.
19	C.T.	62	Old bilateral luetic choroiditis and glaucoma, pains and ocular achiing.	O.D. 6/12 O.S. 6/22	19 18	31 29	24 23	Pilocarpine 1% gtt.i., t.i.d.	O.D. and O.S. 12° central.	0.1% pain and regular aching for 4 days. No reaction to 0.005%.	5	22 24	17 17	15 15	Improved O.U.	0.005% less variation in tension curves... Fields improved.
20	M.S.	56	Chronic simple (1945); O.S. cataract extraction; optic atrophy O.D.	O.D. 6/30 O.S. 6/12	29 17	56 34	28 19	Pilocarpine 2% gtt.i., t.i.d. O.U.	O.D. 25° central. O.S. 10° central.	Sensitive to peanut oil. Had to stop D.F.P.	2 weeks	34 22	19 11	24 13	No change	Conjunctivitis with peanut oil. D.F.P. stopped after 2 weeks.
21	H.W.	49	Bilateral senile cataracts; O.D. extraction (1948); secondary glaucoma; O.S. aphakic and normal.	O.D. light perception O.S. 6/12	17 19	35 24	24 22	Pilocarpine 1% gtt.i., t.i.d. O.U.	O.D. 20° central. O.S. normal.	0.1% used O.D. Only headache first 5 days.	9 9	32 22	17 19	22 20	No change	O.D. 0.01% D.F.P. held tension just as well. No reaction O.S. O.S. No miotic used.
22	I.S.	46	Chronic simple (1945); bilateral iridectomies (1945 and 1946).	O.D. 6/15 O.S. 6/9	11 11	35 40	25 22	Pilocarpine 2% gtt.i., 4× daily.	Superior portions both fields lost 10°–50° below normal.	0.1% ciliary spasm with conjunctival injection. 0.005% no reactions.	10 10	29 22	19 13	21 17	No change	0.005% proved best. No reaction and H.S. ×1 daily. Tension variations less.

years. Chronic simple glaucoma was present in 17 patients or 33 eyes; secondary glaucoma was present in 4 patients or 8 eyes. The secondary glaucoma followed postcataract extractions in 4 eyes, an old keratitis in 2 eyes, and iridocyclitis in 2 eyes. The duration of the glaucoma in this series varied from 10 months to 9 years.

Eye examinations

Visual acuity. This was the best vision obtainable with the patient's correction. All cases were refracted before the survey began and again during the last three months of the study.

Gonioscopic examination. A gonioscopic examination was made of each patient at the beginning of the investigation. When administration of 0.05- and 0.1-percent of D.F.P., was started, gonioscopic examination was again done. No noticeable change was noted in the iris structure under gonioscopic vision after use of D.F.P.

Tension. Intraocular pressure was recorded (Schiötz) before the D.F.P. was given, and tension curves since the patients were first seen were reviewed. After D.F.P. was begun, both in the first series (0.05 percent and 0.1 percent) and the second series (0.01 percent and 0.005 percent), tension readings were taken every day for 4 days, and signs and symptoms noted; then they were taken each week. The highest, lowest, and average tension readings were recorded for previous, as well as D.F.P., therapy.

Visual fields. Central fields were taken in each case before D.F.P. therapy was begun. The fields were all done under 7 foot-candles in artificial light (light was standardized and checked at monthly intervals with a light meter). Visual fields were done every two months. An evaluation of the field changes was made at the end of the 10-month period of investigation (table 1).

Summary

In a series of 41 glaucomatous eyes followed over a period of 10 months, 33 eyes had chronic simple glaucoma and 8 secondary glaucoma.

In 13 patients (25 eyes) one drop of 0.1-percent D.F.P. was instilled at bed time. With the exception of two eyes (Case 3), the patients noted headache, ocular discomfort, blurring of vision, and extension to the sensation of pain. A concentration of 0.05 percent in 8 eyes (Cases 4, 12, 13, and 15) caused only slightly less reaction of similar nature, with the exception of Case 4 in which only a slight rise in intraocular pressure was evident during the first two days. One case (7) was begun with 0.01-percent D.F.P., and no reactions occurred of any type throughout the period. One patient (20) was sensitive to peanut oil, determined by instilling it in each eye after a 4-week free period of D.F.P. Only one individual (17) proved to be what was considered refractory to D.F.P. and the intraocular pressure went up to 56 mm. Hg at the end of five days. The tension returned promptly to an average of 21 mm. Hg and was maintained well with 5-percent pilocarpine.

After an interval of 4 to 6 weeks in which the patients were returned to pilocarpine or eserine therapy, they were placed upon 0.01-percent D.F.P. in 19 cases or 36 eyes. Two patients (13 and 15) or 4 eyes used 0.005 percent D.F.P. with similar results. In two eyes (Case 8), the optimum concentration of D.F.P. to control the tension properly proved to be 0.02 percent. In 18 eyes, 0.005-percent D.F.P. proved just as effective in maintaining proper tension as the 0.01-percent solution.

The tension curves were better maintained with 0.01- or 0.005-percent D.F.P. in all cases with exception of one eye (Case 8). The entire study showed that fluxations of intraocular pressure were decreased by 28.5 percent and an overall reduction in level in tension of 17.4 percent.

The visual fields were not expected to change too much. One case (19) showed the greatest single increase of the central fields. In Case 8 the presence of Seidel's sign dis-

appeared in both central fields, which is attributed to the more stabilizing effect of D.F.P.

The most frequent comment of the patients was in praise of the ease and need of less frequent instillation when D.F.P. was used. Since D.F.P. was given at bed time, the film created by the peanut oil was less annoying. With the exception of Cases 17 and 20, the patients have been pleased with this miotic and prefer it to previous medicants. They stated that their vision was clearer throughout the day when D.F.P. was used.

Conclusions

1. The use of D.F.P. in lower concentration (0.01- and 0.005-percent) has proven it a most valuable miotic in the clinical care of glaucoma patients.

2. The maintaining of a lower and less fluctuating intraocular-pressure curve has been constantly demonstrated throughout the entire 10-month period of this study.

3. The prolonged effect of the drug lessens the frequency of instillation, and the use of more than one drop daily did not lower the tension curves.

4. No detrimental reactions have been manifested in the concentrations of 0.01- and 0.005-percent D.F.P.

Grady Clay Memorial Clinic,
Emory University.

References

Comroe, J. H., Jr., Todd, J., and Koelle, G. B.: The pharmacology of di-isopropyl fluorophosphite (D.E.P.), J. Pharmacol. & Exper. Therap., **87**:281-290, 1946.

Lebensohn, J. E.: Di-isopropyl fluorophosphite (D.E.P.) in treatment of glaucoma. Arch. Ophth., **36**:621-622, 1946.

Leopold, I. H., and Comroe, J. H., Jr.: Effect of di-isopropyl fluorophosphite (D.E.P.) in the normal eye. Arch. Ophth., **36**:17-32, 1946; Use of di-isopropyl fluorophosphite (D.E.P.) in treatment of glaucoma. Arch. Ophth., **36**:1-16, 1946.

McDonald, P. R.: Treatment of glaucoma with di-isopropyl fluorophosphite (D.E.P.), Am. J. Ophth., **29**:1071-1071, 1946.

Scholz, R. O., and Wallen, L. J.: The effect of di-isopropyl fluorophosphite on normal human eyes. J. Pharmacol. & Exper. Therap., **88**:238-245, 1946.

Ophthalmic Miniature

The subdivision of manual labour manifestly tends to perfect the operations of art; but to limit the sphere of Science by the detachment of its parts, is to destroy the foundation upon which it rests. With respect to that of Medicine, however beneficially we may observe the labours of individuals to be occasionally exerted in the selection of particular branches, as the more exclusive objects of their study and attention, yet this can only occur to those who have first investigated this science as a whole; and we may be assured that others who assume a superior knowledge of any branch of medical practice, on the ground of comparative ignorance of, or indifference to the rest, are but little indebted for whatever reputation they acquire, to the actual benefit they are able to effect.

John Vetch, *A Practical Treatise on the Diseases of the Eye*, 1820.

NOTES, CASES, INSTRUMENTS

THE EFFECT OF DI-ISOPROPYL FLUOROPHOSPHATE (D.F.P.) ON THE PUPIL OF THE DARK-ADAPTED EYE*

EDWIN B. DUNPHY, M.D.
Boston, Massachusetts

Englehart[1] in 1931, using rabbits and cats, showed that, when the third nerve was stimulated, a substance was liberated in the aqueous, which had the properties of acetylcholine. It was found to be greatly increased when the eye was exposed to bright light, but it was absent in the dark-adapted eye even

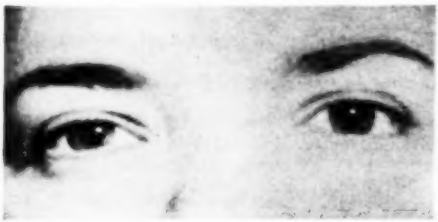


Fig. 1 (Dunphy). Normal appearance of the eyes of subject used in the experiment.

after eserine had been instilled to destroy the cholinesterase.

This being the case, one might infer that the anticholinesterase miotics would have little, if any, effect on the pupil of the dark-adapted eye, since no acetylcholine would be formed in the dark to stimulate the sphincter muscle of the iris. However, Englehart also demonstrated the presence of acetylcholine in extracts of the iris or ciliary body not only of eyes that had been exposed to light, but also of those which had been kept in the dark.

It is true, of course, that during sleep the pupils are miotic, but this might be the result of unconsciousness in which the stronger sphincter tonus prevailed over the dilator tonus due to the removal of inhibitory sympathetic stimuli.

It has already been shown[2] that, if a human eye is exposed to D.F.P. vapor and immediately dark-adapted for one hour, the miosis persists in the dark in spite of the fact that no reflex impulses from light stimulation are travelling over the third nerve. This suggests that the acetylcholine formed in the tissue just prior to dark adaptation cannot be eliminated in the absence of cholinesterase.

A search of the available literature failed to show whether or not an anticholinesterase miotic would produce any miosis if instilled into an eye *in the dark* after complete dark adaptation. The following experiment was therefore devised to ascertain the answer to this question.

A young individual with normal pupillary responses (fig. 1) was dark adapted for 30 minutes in front of a high-speed camera already focused to take a flash photograph of the pupils. At the end of this period of dark adaptation, one drop of D.F.P. (0.05-percent solution) was instilled in the left eye. This was accomplished by means of a special eye-cup originally devised by Heath,[3] and modified so that the subject could instill the drop in his own eye in complete darkness without fear of injury to the cornea. Dark adaptation then continued for another 30 minutes, the flash photograph being taken at the end of this period (fig. 2). This shows the right pupil widely dilated, but the left pupil miotic.

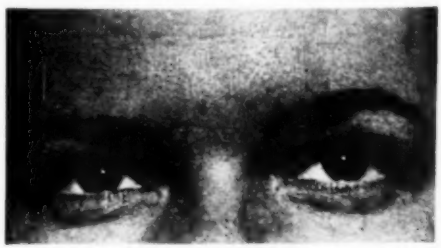


Fig. 2 (Dunphy). Appearance of eyes after dark adaptation and instillation of D.F.P.

* From Massachusetts Eye and Ear Infirmary.

It is obvious from this experiment that D.F.P. will produce miosis when instilled in complete darkness in a dark-adapted eye when no reflex impulses (at least from light stimuli) are traveling along the third nerve. This seems to corroborate the belief generally held among pharmacologists and physiologists that acetylcholine is constantly being formed at all parasympathetic nerve endings as the result of normal muscle tonus.

243 Charles Street (14).

REFERENCES

1. Englehart, E.: Arch. f.d. ges. Physiol., 227:220, 1931.
2. Aldridge, W. H., Davson, H., Dunphy, E. B., and Uhde, G. I.: Am. J. Ophth., 30:1405 (Nov.) 1947.
3. Heath, P.: Am. J. Ophth., In press.

PROGRESSIVE RETINOPATHY ASSOCIATED WITH MENSTRUATION

GEORGE R. LAUB, M.D.
Columbia, South Carolina

History. E. H., a 13-year-old white girl, was seen for the first time on August 9, 1944, with the complaints of slightly diminished vision. She was brought by her parents in order to have some glasses fitted. The examination at that time showed a visual acuity of 20/20 in the right eye and less than 20/800 in the left eye. The external findings for the right eye were perfectly normal, with normal eyegrounds.

The left eye showed some yellowish pinpoint spots between the disc and the macula. They had a peculiar arrangement in so far as they were all within a triangular field with the base at the disc and the apex of the triangle at the macula. The best description of these spots would be that they looked like beginning miliary tubercles.

No diagnosis could be made at that time. The patient was given some simple eye wash for psychologic reasons and was asked to return in a week.

Second examination. On August 16, 1944, the right eye was unchanged, the vision of the left eye was 20/228, the already described spots in the eye had practically disappeared. Her mother told me that during the last week my patient had had her first menstrual period.

On August 30, 1944, she was reëxamined and the vision of the left eye was 20/80. No spots at all were on the retina. On September 13th, the second menstrual period had not yet started, and vision of the left eye was 20/200, with the spots like they were at the first examination.

At that time, the child was admitted to the Columbia Hospital for thorough examination. The medical findings were all negative. X-ray films of sinuses, skull, and chest were all within the normal limits. Urine, blood count, Wassermann, tuberculin, and undulant-fever agglutination tests were negative. Glucose-tolerance test was normal. B.M.R. was normal.

Course. On November 15, 1944, vision in left eye 20/320, the spots reappeared, and at the upper side of the triangle a slight grayish tissue like a fold could be seen. The right eye, during the entire period of observation up to the present time, had always been normal.

Because of trouble with her menstrual periods, which were very irregular, she received at the advise of her diagnostician (Dr. F. E. Zemp) Antuitrin S and some Theelin injections. Her eye condition kept on changing with each period, worse just before the menstruation, best shortly afterwards.

For many months the parents did not return her, but, in February, 1946, when she returned, an entirely different picture was presented. The left eye showed that "the

disc is somewhat paler than the right and, extending out into the vitreous body from the disc towards the macula at an angle of perhaps 10 degrees with the retina, is a gray-

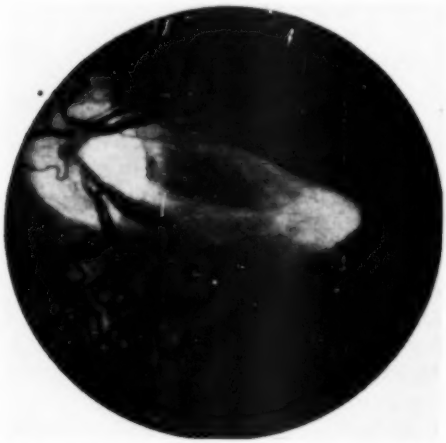


Fig. 1 (Laub). Eyeground of the left eye. (Published with the kind permission of Dr. B. Anderson, Duke University Hospital.)

ish white sheath. This is not associated with a vessel. It is approximately a fourth of a disc diameter in width and appears almost as a fibrous cylinder with tenestra or dehiscences at irregular intervals in the walls. The tip extends well over the center of the macula and from the tip a few darker strands dip down to the macular area. The retina in the macular area is drawn upward toward this tip almost like a tent.

"As viewed with a giant binocular ophthalmoscope, one gets the impression that this tubular whitish sheath hangs out in a cranelike fashion from the disc and, at its tips, raises the retina in a tentlike fold over the macular area. Beneath this tentlike fold in a roughly oval disc about the diameter of which is a dark-brown or black area that is interpreted as being choroidal or subretinal hemorrhage. Extending from the disc vertically to the 3-o'clock position is a fold of retina which would ordinarily be interpreted as a congenital anomaly (retinal septum)."

This quotation is from a report of Dr. B. Anderson at Duke University Hospital, who saw her in consultation and took the photograph at that time (February, 1946), which he kindly permitted me to use for publication (fig. 1). The vision of the left eye was 20/200.

A year later, in March, 1947, the findings of the eyegrounds were apparently unchanged, although the vision dropped to 20/400−. In June, 1948, when I saw this girl last, her vision was unchanged (20/400) but practically no central vision was left. The "tent" as described by Dr. B. Anderson, which used to have a veil-like appearance, increased in density and progressed somewhat further encasing practically the entire macula. The upper part of the tent had an especially dense appearance.

Comment. This case is a very unusual one. There is no heredity factor involved. We had the chance to examine the eyes of the parents, as well as other members of the family, none of whom showed any sign of a pathologic condition of the eyes.

The picture of the eyeground as it appears now could easily be mistaken for that of retinitis proliferans. However, having observed the entire development of the disease over a period of more than four years, having seen the changes of the eyeground with each menstrual period, at first only "miliary tubercles" later the development of fibrous tissue, makes the diagnosis completely obscure. A search of the entire literature and personal discussions with some of the leading ophthalmologists did not throw any light on this case.

Summary

The case of a young girl, whose eyesight as well as eyegrounds changed with each menstrual period is reported. She is gradually loosing the sight of one eye. No description of a similar disease could be found in the literature. It is hoped that, if any ophthalmologist can throw light on this case, he will communicate with me.

1627 Bull Street (1).

DIFFERENTIATION OF CONJUNCTIVAL TUMORS

CLINTON WILSON, M.D.
Los Angeles, California

It is sometimes difficult without histologic study to different pinguecula and early pterygium from early malignancy of the conjunctiva. Missed diagnoses are not unknown. Therefore, some practical means of giving at least a hint of possible malignanty should be useful.

One such means is the use of the Hildreth or the Woods lamp. The ultraviolet light emitted by these lamps causes fluorescence of the lipoid-bearing pingueculas and pterygia but not of the lipoid-free but otherwise similar-appearing structures which may be malignant.

Attention is directed to the matter at this time because of: (1) Confirmation of preoperative diagnoses of cancerous or precancerous lesions made on the basis of nonfluorescence, and (2) the need for widespread investigation, histologic and otherwise, in order to evaluate the worth of this simple procedure.

Such a study might disclose that some fluorescent lesions are malignant and that some nonmalignant lesions are nonfluorescent.

It is good clinical practice at this time, in my opinion, to be suspicious of and therefore to excise thoroughly the nonfluorescent conjunctival lesions. The reports of histologic study of such material would be valuable.

3875 Wilshire Boulevard (5).

A PENLIGHT PROJECTOR FOR THE LANCASTER RED-GREEN MUSCLE TEST*

JOHN M. HILL, M.D., AND FENN T. RALPH, M.D.
New York

This test, devised by Lancaster† for the measurement and interpretation of muscle deviations, involves the use of two flashlight projectors. However, the fact that the commercial projectors are cumbersome, expensive, and not readily available discourages the use of this test by the ophthalmologist.

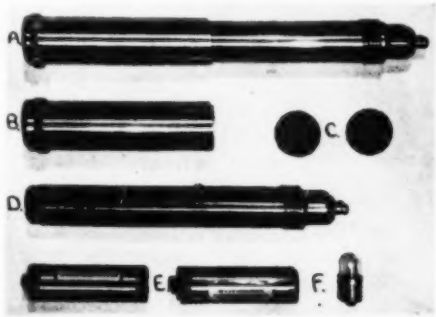


Fig. 1 (Hill and Ralph). (A) Assembled penlight. (B) Focusing sleeve. (C) Red and green disks. (D) Penlight barrel. (E) Penlight batteries —size AA Eveready. (F) Reid-streak retinoscope bulb.

In attempting to overcome this difficulty, the following inexpensive penlight projector was devised. A simple two-cell penlight is utilized, with a straight filament bulb‡ as the source of the illuminated streak. Two condensing or focusing sleeves,‖ one fitted with a small round disk of red plastic, the other with green, slip over the barrels of the penlights and focus the streaks thus produced, at the desired distance of 1 or 2 meters.

In addition to its primary use with the Lancaster red-green test the projector has a secondary function. By removing the red or green plastic disk in the focusing sleeve, the projector, with its illuminated streak, can be used for external eye examination. It may also be used in conjunction with a loupe as a hand slitlamp for examination of the cornea, anterior chamber, and lens.

Second Avenue and 13th Street (3).

* From the service of Dr. Brittain F. Payne, New York Eye and Ear Infirmary.
† Lancaster, W.: Arch. Ophth., **22**:867, 1939.
‡ A Reid-streak retinoscope bulb.
‖ Focusing sleeve obtained from Clairmont Nichols, New York City.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

December 6, 1948

DR. BENJAMIN ESTERMAN, *president*

BIOMICROSCOPIC OBSERVATIONS OF THE CHAMBER ANGLE WITH THE GONIOPRISM

DR. HARVEY E. THORPE said that the first goniobiomicroscopy was performed by Koeppe in 1920 with the aid of his contact lens, a special mirror, and the slitlamp microscope. The technique was difficult and was usually limited to the examination of the nasal and temporal portions of the anterior-chamber angle. Clinical interest in this region of the eye dates back to Leber's demonstrations, in 1873, that the trabecular portion of the angle was the chief exit channel for the aqueous fluid. Further interest was aroused when Knies, in 1876, having discovered the anterior-chamber angle to be obliterated in glaucoma, postulated the closure of the angle to be due to inflammation. One year later, Weber brought forth the view that edema of the ciliary body and processes was responsible for occlusion of the angle.

Trantas of Athens, in 1900, and Saltzman of Graz, in 1914, were the first to publish chamber-angle studies. In this country Troncoso was first to call attention to the contact-lens method for clinical examination of the angle in 1921. It was really Troncoso's work and his invention of aids to gonioscopy which gave this subject its clinical basis. Castroviejo, Reese, and Bruce were among the early workers in this field. Friedman simplified the method of filling the space beneath the contact lens with fluid. Kronfeld, McLean, Sugar, and others have shown the value of gonioscopy for anterior-chamber surgery.

It was Barkan, however, through his studies of the angle and his new approach to glaucoma surgery, who gave this subject further impetus in the 1930s.

Since then, the advent of the Goldman contact lens and more recently the Allen gonioprism have facilitated the examination of this region with the aid of biomicroscope. Two drops of 0.5-percent pontocaine are instilled in the conjunctival sac. A drop of 1-percent methyl cellulose is placed on the concave surface of the plastic gonioprism and the instrument, with its flat reflecting surface below, is inserted between the lids while the patient is seated at the slitlamp.

The slit illumination is thrown into the prism mirror surface and the microscope is focused in the same area to observe the magnified view of the upper angle. The prism is readily rotated within its plastic speculum carrier to observe the entire circumference of the angular drainage area.

Narrowing of the angle, adhesions between the iris root and peripheral cornea, pigmentation or debris or exudate in the trabecular zone are readily recognized by this means. Small foreign bodies hidden behind the limbus within the angle, small pathologic conditions of the peripheral iris, and trauma can only thus be recognized. Moreover, inflammatory corneal processes and keratic precipitates can thus be seen from the posterior view. If corneal edema presents a problem, a drop of glycerine usually dehydrates the cornea sufficiently to facilitate both angle and fundus studies. One of the benefits resulting from this technique is the ability to study our own handiwork after glaucoma and cataract surgery. We can thus tell why we fail in one cyclodialysis or trephination and succeed in another, and why a cataract extraction with delayed chamber restoration frequently results in subsequent

glaucoma. Gonioscopy has aided in our understanding of the pathologic processes of the visible angle and helps in planning the medical and surgical management of cases in which the chamber angle is concerned.

Circulatory aspects of the glaucoma problem

Dr. John N. Evans delivered the annual Mark J. Schoenberg Memorial Lecture. He discussed certain aspects of ocular circulation. He called attention to the fact that the aqueous and the vitreous might be termed the "fourth circulation." (The "third circulation" was a term created by Harvey Cushing in referring to the cerebrospinal system fluid.) He presented illustrations from original work which lent strength to the idea that the vitreous is probably much more active in a nutritive and dynamic sense than is usually recognized. He suggested that the remains of the vitreous vascular fetal system may act as cleavage planes to help conduct the aqueous element of the vitreous to the posterior drainage system by way of the perivascular spaces.

He pointed out that the choroid in health is much thicker than we are led to believe from the study of histologic preparations. He discussed the possible mechanism of vitreous-chamber fluid pressure associated with the rapid changes in volume of the choroid which take place in nervous shock, and so forth. The mechanism taking part in such changes is related to the action of the so-called capillary sphincter muscles, the structure which he described in a communication about a year ago. He stressed the point that therapeutic and surgical measures should be designed especially for the relief of vitreous pressures in cases of glaucoma. Dr. Evans illustrated his paper with numerous slides from original studies. (The lecture will be published in an early issue of the Journal.)

Bernard Kronenberg,
Recording Secretary.

LOS ANGELES OPHTHALMOLOGICAL SOCIETY

December, 1948

Dr. William Endres, *chairman*

The textbook retina and the real one

Dr. Gordon L. Walls of Berkeley (by invitation) presented an illustrated lecture correcting many of the errors and half truths concerning the retina as described in most textbooks.

The retina does not end at the ora serrata, but at the margin of the pupil. In lowly vertebrates the sensory retina degenerates if the opticus is cut, but a new retina regenerates from the ciliary epithelium, which is actually retinal tissue.

The retina is not a mere part of a sensory organ. It is the visual sense organ, and more. All other parts of the globe are as much accessory as are extraglobar orbital structures. The retina is homologous with the whole thickness of the brain wall, and is more a sense organ since it contains its own associational systems mediating facilitative and inhibitional phenomena, and can almost "think."

The retinal layers traditionally taught have no meaning. Functionally, the retina has only four layers: (1) the purely nutritive pigment epithelium; (2) the visual-cell layer; (3) the layer of internuncial neurons; and (4) the ganglion, so thinly distributed that it forms a "layer." At either side of the internuncial layer, funneling and spreading of excitation and inhibition are mediated by the horizontal and amacrine cells and by the diffuse dendrites of large bipolar and ganglion cells.

Rods and cones are neither nerve cells nor neuro-epithelium, but modified ependymal cells which were formerly flagellated, as is shown by their cytogenesis as well as by their situation in the developing optic cup.

The rods are not historically older than the cones, as is generally taught (and as is

assumed in the Ladd-Franklin theory of color vision). But the first cones did not mediate color vision—nor did the first rods contain visual purple, which is by no means a primitive visual photochemical but an ingenious one which conveniently decolorizes in bright light (preventing dazzlement).

Cones have secondarily given rise to rods, and vice versa, through evolutionary transmutations. The two are not immutable structural types. Pure-cone, diurnal animals have had nocturnal descendants with duplex and even pure-rod retinas. Human cones were derived from lemuroid rods and are not homologous with cones outside of the Primates.

Human cones are not conical. Adequate micrologic methods show their outer segments to be cylindrical and as long as those of rods. Moreover, each cone outer segment is ensheathed by (and possibly continuous with) a tubular process from the nearest pigment-epithelium cell. This trophic arrangement, demanded by the elevated metabolism of the cones (as opposed to rods), explains why vision never returns perfectly after a detachment is repaired.

The cones are not most numerous in the extramacular fundus and fewest at the ora; nor are the rods most numerous at the ora. Osterberg found the densest rod population in a zone only 5 to 6 mm. from the fovea. The rods are actually denser here (160,000/sq. mm.) than are the cones in the fovea.

What the textbooks call the "macula" is actually the *area centralis*. The fovea, properly, is the depression in this area. The macula lutea is by definition the region containing a yellow pigment. With a purple filter described by Walter Miles, the macular pigmentation can be seen entoptically. It is found to be actually smaller than the foveal pit, though textbooks describe the fovea as occupying a small portion of the macula. The human area centralis may have a diameter of 10 to 12 degrees, the foveal pit 6 to 7 degrees, the macula lutea 2 to 2.5 degrees; and, the rod-free spot is only 50 minutes of arc in diameter. The cones in this spot are slenderized to promote acuity and elongated to preserve their sensitivity.

The center-to-center separation of adjacent foveal cones is 24 to 28 seconds, which happens to be about the value of the smallest resolution thresholds reported for Landolt-ring targets. But this is mere coincidence. Resolution thresholds may be made as small as desired with parallel-line targets, simply by increasing the thickness of the lines. The resolution target then intergrades with one presenting a bright line on a black field, and for such a line there is no minimal visible width.

Resolution of lines does not require an unstimulated row of cones between stimulated rows, hence is not limited by the diameter of one cone. It is only necessary that the rows of cones be differentially stimulated; so, it is the intensity-discrimination function that sets the limit upon visual acuity: in resolution, one is discriminating intensities within the diffraction retinal image of the target. The conception of the mental image as being made up of dots, each contributed by a cone, is fallacious and outmoded.

The "retinal local signs" so important in space perception are neither retinal nor local, but cortical and directional. The stimulation of a retinal point arouses a cortical point which now has information regarding oculocentric direction but not of distance, hence not of place. Space is more finely graduated than is the visual-cell mosaic (as vernier and motion acuities show), since the multiplication of paths between the cones and the cortex makes a great number of cortical elements correspond to two adjacent cones. Differential illumination of these cones can cause activity to "peak" in any one of many cortical cells, so that the spatial point may be directionalized between the produced axes of adjacent cones. Visual space is thus made subjectively "continuous."

Orwyn H. Ellis,
Recorder.

OPHTHALMOLOGICAL SOCIETY OF MADRID

May 14 and June 18, 1948

Hydatidiform cyst of orbit

Dr. Marin Amat and Dr. Benzo, in discussing the surgical cure of a hydatidiform cyst of the orbit, referred to the case of a 5-year-old boy who had had intense pain in his left eye for 2½ months and awoke one day to find his lids greatly swollen. During the 2 or 3 days that the lids remained swollen, the pain was gone. The cycle repeated itself every 3 or 4 days.

Examination of the left eye showed a pronounced, irreducible exophthalmos; very marked edema of both lids, especially the upper; slight erythema of the skin of the lid; almost complete limitation of ocular movements; sensation of a fluid wave in the upper inner angle of the orbit; and visual acuity of ¼. The fundus showed a white papilla, with sharply defined borders and normal vessels, that is, a developing, simple (descending) atrophy. Laboratory findings gave a red blood count of 5,040,000; leukocytes, 10,700; eosinophiles, 6; lymphocytes, 50. The Arneth index showed a deviation to the right, the intradermal reaction of Cassoni was positive after 6 hours, and positive after 24 hours.

A Krönlein operation was performed and, at the apex of the orbit, situated between the superior rectus and the inferior rectus, was a cyst, the size and shape of a small date, having a thin covering which broke during the dissection and poured out a colorless transparent liquid. The operation was completed by repositioning the osteo-musculocutaneous tissue.

The postoperative course was followed by an intense inflammatory reaction (of an allergic nature) which lasted nearly a month. At the end of this time, a cure was obtained with conservation of vision and a perfect cosmetic result.

Discussion. Dr. Mario Esteban opened the discussion by saying that Dr. Marin Amat had reviewed the symptomatology and differential diagnosis of hydatidiform cysts of the orbit so completely that there was nothing to add. He only pointed out that one must not ascribe an absolute role to the eosinophilia, since it is absent in some cases, and on the other hand may be present in tumors, as in sarcoma. Puncture for diagnostic purposes must not be done without taking precaution against an anaphylactic shock.

As for treatment, surgical extirpation is better than injection of modifying substances. The latter method should be reserved, as in the early days of marsupialization, for those cases where the extirpation is difficult or where, because of the situation and adhesions of the cyst, important organs have to be sacrificed in the operation. However, he recommends to puncture the cyst with a syringe before the operation in order to remove some of the contents, taking care not to spill any of the hydatid liquid on the tissues and, without retracting the needle, inject some formalin into the cavity before detaching the membrane, which ruptures easily. Evacuating the contents of the cyst leaves the membranes flaccid, which facilitates the extirpation, and the injection of formalin is useful for its sterilizing effect.

Cysticercus of the vitreous

Dr. Marin Amat and Dr. Marin Enciso presented a man, aged 39 years, who had lost the sight of his right eye a year and a half before, after a period of violent pain and acute inflammation, and who for the past several days has noticed complete, momentary lapses of sight in his left eye.

Examination showed in the vitreous of his left eye a cylindrical shaped vesicle fairly large and of a bluish color, with a rounded end at the upper part of the fundus and at the other end a thin and long, necklike structure which ended in a rounded area, like a head. The vesicle displayed lively movements of displacement and contraction, especially of the head and neck of the parasite, which reminded one of the antennas of a snail.

The right eye showed an atrophic iridocyclitis, perhaps also of a parasitic origin. Laboratory tests were negative to the Wassermann, urine, Weinberg, and Cassoni tests. Erythrocytes were 3,650,000; leukocytes, 4,800; eosinophiles, 2; and lymphocytes, 27 percent. The patient was seen by other members of the staff who agreed with the diagnosis.

Corneal opacity with microcornea

Dr. Marin Amat presented a 5-month-old girl who, shortly after birth was treated with injections of Hepabismuth. She received 36 intramuscular injections twice weekly, and no results were obtained. The child's eyes were turned upward all the time, hiding the cornea under the upper lid, as is found in those born blind. She was given a subconjunctival placental injection (Filatov's method) in hope that it might stimulate the biologic development of the fetal cornea tissue.

Retinal edema

Dr. Marin Amat presented a patient who showed a quadrangular zone of retinal edema between the macula and the papilla apparently due to a disturbance of the circulation. He thought the condition was due to a spasm of a cilioretinal vessel whose exit from the papilla at the border of the scleral opening was compromised and appeared thin and threadlike.

An examination of the patient showed, in addition to the edematous zone, a slight clouding of the retina in the upper half, the upper branch of the central artery of the retina was thin, almost threadlike. Perimetric examination showed a loss of vision in the lower half of the visual field, although central fixation was retained.

Treatment with vasodilating drugs (acetylcholine, vasil, eupaverine, nicotinic acid) prevented a spasm of the inferior branch of the central artery, which usually occurs. By using intramuscular injections of organic iodine, a satisfactory cure was obtained, the patient having a visual acuity of 1.00 (20/20) in the eye and only a slight peripheral reduction of the visual field in the lower part. However, there remained a slight pallor of the papilla and a slight reduction in the caliber of the arteries in the upper half of the retina as compared to those of the lower half. The favorable outcome of the case is shown by the visual field charts taken during the course of the disease. In addition to this result, which is worth while reporting, the case offered the unusual opportunity of following ophthalmoscopically the evolution of a retinal arterial spasm.

Ptosis operation

Dr. Marin Amat showed a girl who was operated on for congenital ptosis of the upper lid by the procedure of Friedenwald and Guyton. The simplicity and effectiveness of this method deserve its widespread application (published in the American Journal of Ophthalmology, 31:411 (April) 1948).

Epibulbar epithelioma

Dr. Marin Amat and Dr. Marin Enciso presented the case of a woman who, following the embedding of a foreign body in the cornea, developed a wartlike structure in the upper-outer portion of the corneal limbus. It was removed three times, but rapidly reformed. She entered the Provincial hospital of Madrid where the authors diagnosed the lesion as an epithelioma.

Operation consisted of complete extirpation of the neoplasm with treatment of the region of the implantation at the corneal limbus by diathermy and a conjunctival covering. Histopathologic examination showed the lesion to be a prickle-cell epithelioma, a type most refractory to radiotherapy. Four months after the operation there was no recurrence. Visual acuity was normal and the globe was not affected.

Leukosarcoma of iris

Dr. Marin Amat and Dr. Marin Enciso presented the case of a 46-year-old

woman who had had a circumscribed lesion in the iris for a period of 10 years which gave her no trouble until the beginning of the year when she showed a hemorrhage in the anterior chamber. This was absorbed in a few days, but shortly thereafter there occurred a more extensive hemorrhage which alarmed the patient considerably. The examination showed a neoplasm, the size of a grain of rice, white and surrounded by many thick capillaries, and in addition a deposit of dark brown blood (the remains of the last hemorrhage) in the anterior chamber. The condition was diagnosed as leukosarcoma, and the treatment consisted of excision of a large section of the iris which contained the neoplasm. Histopathologic examination confirmed the clinical diagnosis of a leukosarcoma. The postoperative course was uneventful, and resulting vision was 20/20.

The authors then discussed the apparent rarity of a leukosarcoma in a pigmented organ like the iris, the slow evolution of the neoplasm, the uncertainty of the time period for the development of metastases in distant organs, and the great advantage of being able to preserve the eye and normal vision whenever possible.

Discussion. Dr. Carreras Matas said that this case was a typical example of a sarcoma of the iris which is curable by extirpation of the iris. More delay might have proved too late and the patient should be congratulated on having been treated so wisely and in time. That the lesion was a leukosarcoma is rather curious. One must remember, however, that, although it originated in a tissue very rich in melanophores, the melanoblasts in the adult eye are very scarce, being found almost exclusively at the corneal limbus.

Retinitis punctata albescens

Dr. B. Carreras Matas referred to an observation of a patient with retinitis punctata albescens who, having had hemeralopia of a half hour's duration, began to notice at the age of 18 years absence of the disturbance on rainy days although not consistently. This indicates a shortening of the time of adaptation and an evident improvement.

Discussion. Dr. Marin Amat said that the interesting thing about this affection were the points which this condition has in common with pigmentary degeneration of the retina and the points wherein the two conditions differ.

The points in common are: (1) Both are congenital, (2) appear in the first years of life, (3) are found in several members of the same family, and (4) the patients show difficulty of adaptation to low illumination.

The differences are (1) In the progress (pigmentary degeneration is always progressive, whereas retinitis punctata albescens very rarely increases), (2) the fundus shows completely opposite pictures (black spots in one and white spots in the other, with alteration in the retinal vessels and atrophy of the papilla in the advanced stages of retinitis pigmentosa), (3) alteration in the visual field in retinitis pigmentosa begins with a large annular scotoma with preservation of the peripheral and central fields and in retinitis punctata there is a concentric contraction.

Dr. Matas, in closing, said that the ophthalmoscopic pictures described by Japanese authors on hemeralopia due to dietary deficiencies are very suggestive. The observations of Dr. Tena Ibarre refer to the progressive form of the disease. But there certainly exist benign forms which tend to get better. Our patient is one of them.

Plastic surgery of lid

Dr. Tena Ibarre presented a case of blepharoplasty of the upper lid. The method of Fricke (tissue taken from the temple) and the method of Snydacker (taken from further parts) were used, and the result esthetically and functionally was perfect.

Joseph I. Pascal,
Translator.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

Address original papers, other scientific communications including correspondence, also books for review to *Dr. Derrick Vail, 700 North Michigan Avenue, Chicago 11, Illinois;* Society Proceedings to *Mrs. Katherine F. Chalkley, Lake Geneva, Wisconsin.* Manuscripts should be *original copies,* typed in *double space,* with wide margins.

Exchange copies of medical journals should be sent to *Dr. F. Herbert Haessler, 561 North 15th Street, Milwaukee 3, Wisconsin.*

Subscriptions, application for single copies, notices of changes of address, and communications with reference to advertising should be addressed to the *Manager of Subscriptions and Advertising, 664 North Michigan Avenue, Chicago 11, Illinois.* Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the *Manuscript Editor, Mrs. Katherine F. Chalkley, Lake Geneva, Wisconsin.* Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

ACTH IN MYASTHENIA GRAVIS

One of the functions of the editor of an ophthalmic journal is to bring to the attention of his readers discoveries in other fields of medicine that may be of significance in his specialty and to point out lines of investigation that may be fruitful in his field.

Since last May when the Mayo Clinic announced the spectacular results that had been procured by treating rheumatoid arthritis with Compound E, or cortisone, the medical world has been impressed, stimulated, and exhilarated. Ophthalmologists share in this excitement for ocular signs and symptoms, even blindness, are frequently associated with rheumatoid arthritis and rheumatic fever. To cite some examples, phlyctenular conjunctivitis, scleritis, iritis, keratoconjunctivitis, scleromalacia perforans, Reiter's disease, Behçet's syndrome, and others.

Cortisone, prepared solely form bile acid, is difficult and expensive to produce and the quantity for experimental studies is restricted. The newer drug, adrenocorticotropic hormone, called ACTH at present, presumably stimulates the adrenal glands to secrete more cortisone. ACTH is an extract of the pituitary of hogs. It is said that about 200,000 hogs are required to produce half a

pound of the drug. It is, therefore, costly to produce and extraordinarily difficult to prepare. The clinical work that is necessary to prove the usefulness of this product cannot be done until an adequate supply is available.

The United States Public Health Service is attempting to discover new sources of supply, and has reason to believe that the African Strophanthus sarmentosus seed may provide more of the remedy. A joint expedition sponsored by the Public Health Service and the Department of Agriculture has been dispatched to Africa, Malaya, Liberia, and China to obtain specimens of various plants. The synthesis of the drug will require much effort and time. Thus, we see that the physicians in daily practice and their patients have a long wait ahead before an adequate supply of either cortisone or ACTH is available for daily use.

In the meantime, as is usual when any new and startling remedy is announced, the drug is being tried in conditions other than that for which it was first employed, in this case rheumatoid arthritis. Dr. Torda and Dr. Wolff report in the *Proceedings of the Society for Experimental Biology and Medicine* (71:432, 1949) on the effects of adrenocorticotropic hormone on neuromuscular function in patients with myasthenia gravis.

It was administered by these investigators to patients with myasthenia gravis mainly on the basis of the following observations and inferences: (1) The immediate cause of the symptoms of myasthenia gravis is a decrease of acetylcholine synthesis; (2) administration of ACTH increased acetylcholine synthesis in vivo; (3) increase of the lymphatic tissue, round-cell infiltration of various organs, mainly striated muscle, and hyperfunctioning thymus have been found in patients with myasthenia gravis (studies have shown that one of the sources of the substances that inhibit acetylcholine synthesis is the thymus—administration of ACTH induces reduction of the mass of the thymus and the lymphatic tissue); (4) removal of the pituitary gland in rats induces changes in the electromyogram that closely resemble the abnormalities noted in patients with myasthenia gravis; and (5) the pituitary gland of several patients who died of myasthenia gravis showed accumulation of an eosinophilic colloid material suggesting altered function of the gland.

Torda and Wolff administered 400 mg. adrenocorticotropic hormone in amounts of 20 mg. every six hours to five patients moderately to severely ill with myasthenia gravis. "Changes that may indicate the beginning of an incomplete remission occurred after completion of the injections. These changes consisted of decrease of the symptoms and outward manifestations of muscle dysfunction, disappearance of the abnormalities noted in the electromyogram, increased work performance in the ergograph, and increase to normal of the ability of serum to support acetylcholine synthesis. The incomplete remission appears to be long standing."

The authors of the report exhibit a praiseworthy restraint in reporting their findings. Those who take the trouble to read the paper will be impressed with the high scientific caliber of their work and presentation, quite different from many reports of the results obtained from other "biogenic stimulators."

One can foresee in the near future the employment of ACTH in all sorts of chronic and hitherto unexplained maladies, even retinitis pigmentosa, for example. This is praiseworthy and necessary; but it is to be hoped that, like those of Torda and Wolff, such clinical experiments will be conducted on the highest scientific plane and the results modestly and properly presented.

Derrick Vail.

LIGHTING FOR TRAFFIC SAFETY

Visual impressions register more slowly as the level of illumination drops. Consequently, motor accidents at night entail a

severer toll in deaths, injuries, and property damage since the driver is allotted less time and space to avoid contact or reduce the force of impact. Per accident at night the bodily injuries are more serious and the property damage 50 percent higher than in daytime.

Night driving is being facilitated by more efficient headlights and more adequate illumination on streets and highways. In daylight, an obstacle is distinguished by the detail revealed by its reflected light. Enough artificial light to allow such discernment is not generally practicable nor indeed necessary except for crowded business areas.

Satisfactory visibility is obtained if the background is brighter than the object (silhouette discernment), or if the object is brighter than the background (reverse silhouette). Adequate pavement brightness permits all important pavement details to be seen and makes silhouette discernment effective.

Pavement brightness depends on the illumination and the pavement reflectance. The diffuse reflection factor of a 10-year-old concrete pavement is 22 percent; of similar asphalt and brick pavements, 7 percent. The more-reflecting surface gives a greater distance of road visibility. Pedestrians are the most important of obstacles, and the reflectance of their clothing ranges from 2 to 15 percent, the average for men's clothing being 5 percent.

When electric lighting was first applied to headlamps in 1914, the single all-purpose beam provided a compromise between road illumination and glare. The dual beam became necessary as operating speeds increased, and was introduced in 1930. The driving beam of 50,000 candle power allowed seeing at a sufficient distance to stop a car travelling 45 miles per hour in about 200 feet. This apparently fulfilled the requirements, since the motorist's line of sight usually centers at a point approximately 200 feet ahead of the car. But, because of the time factor in vision, decreased visibility accompanied further speed. For each increment of one mile per hour in speed, a driver perceives an unexpected obstacle at two feet less distance.

Since 1940, the driving beam produced by a pair of headlights has been increased to 75,000 candle power. The depressed beam for the reduction of glare now directs more light to the right edge of the road which aids vision during the approach of another car. The reflector, filament, and lens are aligned and hermetically sealed during manufacture to insure perfect and permanent focus. The "sealed beam lamps," now in universal use, maintain almost their initial output throughout the life of the car. When driving in dense fog, the depressed beam must be used as the layer of lighted fog between the roadway and the driver's eyes is then thinner and so causes less interference with seeing.

On city streets and on roads with high traffic density, headlamp lighting alone is insufficient. Fixed lighting is necessary which should give a minimum value per square foot of street surface of 0.4 to 1.2 foot-candles, according to the density of pedestrian and vehicular traffic. Controlled light direction is obtained by the reflector-type pendant luminaire. Glare is avoided by raising the lamps high above the street level. The glare effect at the height of 20 feet is double that at 30 feet. The entrances of long tunnels must have supplementary lighting for daytime operation to avoid a too abrupt light change. At 25 feet from the tunnel entrance, the illumination should be 100 foot-candles; at 100 ft., 25 foot-candles.

With the same amount of light similarly distributed, equal visibility is produced by sodium-vapor, mercury-vapor, and filament lamps.

The filament lamp is best adapted for general use. It produces light of pleasing color and is available in a wide variety of sizes. Globes of clear rippled glass are

preferable because of the low light absorption.

Mercury-vapor lamps for street lighting are made in 250- and 500-watt sizes. Although costly to install, their high efficiency makes maintenance economical. The color contrasts well with the display lighting of business districts. In Los Angeles, the obsolescent arc lamps on Broadway were recently replaced with 16,000 lumen mercury-vapor units. The new lighting gives the street two foot-candles as compared with 0.31 foot-candles of the old system at 20 percent of the operating cost.

Sodium-vapor lamps are only in 10,000 lumen units. This attention-getting light is especially good for underpasses, bridges, railroad crossings, sharp curves, and dangerous intersections. The yellow light gives complexions an unnatural appearance and hence is not desirable for city streets. Sodium-vapor lamps are much more costly than equivalent filament globes but give nearly three times as much light per watt.

City lighting systems were originally designed for protection against robbery and other crimes; lighting to enhance business areas followed; but only lately has lighting for traffic safety become a goal. Since 1910, the expenditures for street lighting have gone up but 60 percent while the speed of cars has doubled and the traffic density has increased fivefold. The main traffic arteries in towns and cities, although one tenth of the total street mileage, account for half of all urban fatalities. The National Safety Council asserts that 35 percent of all night traffic accidents are traceable to inadequate lighting. The overall ratio of night to day fatalities has increased from 1.0, in 1930, to 1.4, at present, due to the lag of night lighting in relation to the growth of traffic.

In Chicago, a 1940 study showed that 35 percent of the total traffic fatalities occurred in 4.4 percent of the total street milage, and that more than 62 percent of the fatalities happened at night. After five dangerous insections were provided with improved lighting, the total night accident rate dropped 37 percent. In Detroit in 1936, the average illumination on the main thoroughfares was 0.2 foot-candles. When this was increased to 1.2 foot-candles the ratio of night to day fatalities on these streets decreased from 6.9 to 1.4. Since November 1, 1946, when Indianapolis revised its prewar lighting, the annual night accidents on a typical busy street fell from 23 to 14. In Los Angeles, the improved street lighting inaugurated in 1947 reduced night pedestrian fatalities by 33 percent over the previous year. A decade of good lighting in Hartford, Connecticut, showed, in comparison with the previous decade, a reduction of 76 percent in night fatalities, 78 percent in pedestrian injuries, and 58 percent in all types of accident.

During the depression of 1932, Detroit reduced its lighting 35 percent, and, as a consequence, the proportion of night to day fatalities doubled. The cost of caring for the victims of traffic accidents more than exceeded the savings. In the dim-out of 1942 the ratio of night to day fatalities in New York City and Long Beach, California, rose from 1.33 to 2.15. In Connecticut the night accident rate that year increased 35 percent.

Automobile accidents are brought about by a combination of circumstances, and the removal of one factor often results in avoiding the accident. The more certain seeing provided by good lighting reduces the accident quota previously attributed to inattention, carelessness, fatigue, speeding, or drunkenness. At minimum visibility drivers reacted to an unexpected obstacle at 20 to 80 percent of the distance noted when warned of its presence. Hence a safety factor of 2 to 5 is required for the variation in driver attention alone. In reading with 10 foot-candles, as compared with the minimum illumination necessary (0.1 foot-candles), the safety factor is 100. In instruction signs on the road the color combinations chosen should be those seen best under

minimal illumination, such as black on aluminum, white on dark green, black on yellow, or black on white.

Accidents preventable by good lighting cost the nation annually 10,000 lives and $187,000,000. Modernized lighting is expensive, but it can be had at half this dollar loss and would, moreover, expedite pedestrian and vehicular traffic, increase property values, reduce crime, and promote civic pride.

James E. Lebensohn.

CORRESPONDENCE

Professor Meller's Birthday

Editor,
American Journal of Ophthalmology:

Many of the readers of the JOURNAL will be interested to hear that Prof. Joseph Meller's 75th birthday will be celebrated at the University of Vienna on October 22, 1949. Somewhat older than when seen last by most of his American friends, but unbroken in body or spirit by the trials and tribulations of the last decade, Professor Meller will receive the international group of well-wishers and congratulators with the multilingual warmth and sparkling wit for which he is so widely known.

Joseph Meller was born in the town of Stein on the Danube on October 22, 1874, attended primary and middle school in the nearby town of Krems, and university and medical school in Vienna. During his undergraduate years, he showed special interest in anatomy and internal medicine.

Just when and how Meller's mind turned toward ophthalmology as a vocation is not known to me. The fact is that Meller's ophthalmic career started in 1898 when he became a resident at the Second University Eye Clinic or, as everybody then knew it, the Fuchs Clinic in Vienna.

Right from the beginning, he and ophthalmology got along well. He ascended the academic ladder with remarkable rapidity. In 1905, he had advanced to the position of first assistant; in 1912, to that of associate professor. In 1915, he was appointed to the Chair of Ophthalmology at the University of Innsbruck, from where he returned to Vienna in 1918 when, through one of the last decisions of the Austrian Emperor, he was appointed professor of ophthalmology and director of the First Eye Clinic at the University of Vienna.

After having reached ophthalmic maturity and fame in the heydays of the Austrian Empire and of the Viennese Medical School, Meller now had to shoulder the responsibility for carrying on under most adverse, most discouraging conditions, which—with brief intermissions—prevailed up to the time of his dismissal by the Ministry of Science and Education of the German Reich in 1944.

As early as 1939, one year after the "Anschluss," and again in 1942, Meller had submitted his resignation, but was prevailed upon by the Executive Faculty to continue at his post. His frankness in academic matters had led to a number of disagreements with the "Authorities in Berlin" which in a letter dated May 10, 1944, finally relieved him of all his academic duties "in the interest of the younger academic generation."

After 25 years of leadership under the most varied but never really favorable conditions, Meller retired to literary work and private practice in which he is still actively engaged.

Meller's scientific accomplishments are too well known to require more than brief mention here. There is no field in ophthalmology to which he has not made important contributions. His list of publications, 124 up to date, clearly reveals pathology as his main approach to ophthalmic problems, and as the recommended and actually practiced basis of his clinical thinking and acting.

Of his many fields of special attainments, his work on the tuberculous etiology of endogenous uveitis is probably most signifi-

cant. In Meller's own classification of ophthalmologists, he undoubtedly belongs to the small group that "keeps on working indefatigably in order to produce more and newer evidence in favor of the tuberculous etiology of endogenous uveitis."

In the United States, Meller is probably best known as the author of his textbook on *Ophthalmic Surgery*, the first edition of which was published in English in 1908. During a period of 40 years, seven editions of this text have been printed and avidly absorbed by ophthalmic readers all over the world. The success of this book, in my humble opinion, is due to Meller's mastery of the art of ophthalmic surgery as well as to his mastery of the art of clear, logical ophthalmic thinking, speaking, and writing. Of both of these arts he has given most generously. Three fourths of all the surgical patients of the clinics under Meller's direction have had the opportunity and benefit of his own, personal, surgical skill.

His mastery of the art of clear logical thinking accounts for his success as a teacher. His great gift of making the principles of ophthalmology attractive and fascinating to the undergraduate student is matched by a much-envied facility in presenting transcendental ophthalmology to very learned audiences.

During 44 years of academic activity, Meller has raised a large ophthalmic family, the American members of which, in the simple fashion of this country, will want to add "many happy returns" to the wishes of those who will be fortunate enough to attend the birthday celebration personally.

(Signed) Peter C. Kronfeld,
Chicago, Illinois.

BOOK REVIEWS

SURGERY OF THE EYE. By Meyer Wiener, M.D. New York, Grune & Stratton, 1949, second edition. 392 pages, 425 figures, index. Price, $12.00.

The first edition of Dr. Wiener's popular book on ophthalmic surgery and a second printing of it were quickly absorbed. The new publishers have performed a useful service in bringing out this second edition.

It has been revised and some parts have been rewritten by the author, who has brought up to date the advances in this art that have occurred in the last 10 years. This includes cataract sutures, goniotomy, and orbital implants. The author's method of corneal transplantation by means of a specially constructed punch is described and promoted as a tried and proven measure.

Old readers who are familiar with the first edition will recognize the arrangement of illustrations and text as old friends. Newcomers will find much of interest, value, and instruction. The views expressed, while generally universally held, are primarily based upon the experience of a great ophthalmic surgeon.

Derrick Vail.

CLINICAL ORTHOPTICS: DIAGNOSIS AND TREATMENT. By Mary Everist Kramer, Supervisor, The Orthoptic Department, The George Washington University Hospital, Washington, D.C. Edited by Ernest A. W. Sheppard, M.D., Professor of Ophthalmology, and Louise Wells Kramer, Certified Ophthalmic Technician. St. Louis, The C. V. Mosby Company, 1949, 475 pages, 147 illustrations, cloth bound. Price, $8.00.

The discussions of orthoptic training, strabismus, fusion, amblyopia ex anopsia, abnormal retinal correspondence, convergent and divergent strabismus, the vertical deviations, and the heterophorias are taken up in order. The author with the assistance of her co-writers presents an excellent resume of the anatomy, the visual pathways and oculomotor system, physiology, and optics for the use of an associate in the ophthalmic field.

At the end of each chapter are questions

relevant to the material presented and a list of references.

The different types of instruments including the major amblyoscopes and the other equipment available for making an examination of the ocular muscle balance are given and the mechanics illustrated.

The chapter on surgery by Dr. Ernest A. W. Sheppard emphasizes the importance of a complete diagnosis before surgery is outlined. The discussion of reading disabilities completes the presentation of orthoptics, as the hope of many parents of these children is that ocular training will improve reading ability. Miss Kramer discusses the complex problem and gives a list of references that will help the physician, as well as the parents, when confronted with reading problems in children.

Beulah Cushman.

Le Meningo-Endocraniosi in Oftalmologia. By Alfio Rubino. Bologna, 1949. 93 pages, 25 figures, bibliography.

In this monographic treatment of chronic arachnoiditis, the author indicates the importance of an understanding of the syndrome for many branches of medicine—neurology, endocrinology, and radiology, no less than ophthalmology.

A short review of the history of our knowledge of the lesion goes back to Morgagni. The author then discusses the etiology and pathogenesis and the relation to lesions in contiguous tissues. After a discussion of the general symptoms and radiologic signs, the eye manifestations and their significance are described and discussed in detail.

For example, the author points out the significance for topographic diagnosis of his "small chiasmatic syndrome" which consists of edema of the optic disc with passive hyperemia of the central retinal veins and signs of arterial and venous hypertension combined with a bitemporal upper quadrant hemianopia for color. In another chapter the relationship of the lesions to classic opticochiasmatic arachnoiditis is discussed at length. There is possibly a relationship to the Laurence-Moon-Biedl syndrome and to Leber's optic atrophy. In the concluding chapter some therapeutic suggestions are made.

F. H. Haessler.

Transactions of the Ophthalmological Society of New Zealand (supplement to the New Zealand Medical Journal. Wellington, New Zealand, British Medical Association (New Zealand branch), 1948. Pamphlet form, paper covers, 74 pages.

Herein are published the papers presented at the second conference of the Ophthalmological Society, held at Dunedin, February, 1948. In addition to other papers mentioned below, the report is outstanding by reason of the presidential address, by Rowland P. Wilson, on "Some conjunctival affections." Dr. Wilson is well known for his 19 years of work in Egypt, the reports of which used to appear in the annual transactions of the Giza Institute of Egypt. His presidential address before the New Zealand society is chiefly occupied by an excellent review of the present status of knowledge concerning trachoma, although it deals also with various aspects of bacterial conjunctivitis, follicular conjunctivitis, spring catarrh, and allergic conjunctivitis. (Trachoma is approximately absent from New Zealand, except perhaps among the Maoris of the North Island.)

It is emphasized that what has been historically referred to as "military ophthalmia" or "ophthalmia egyptica," on account of its great incidence among the French and British armies during the Napoleonic campaign of 1798-99 in Egypt, was not an uncomplicated trachoma but a combination of trachoma with various forms of acute bacterial conjunctivitis, the greater part of the affected soldiers being blinded by acute

gonococcal conjunctivitis. Actually, not more than one percent of the blindness in Egypt is due to trachoma, although at least 95 percent of the indigenous population of Egypt is infected by that disease. "Trachoma is of low infectivity and only flourishes in the presence of bad hygienic conditions, carelessness, and apathy." "Unfortunately one of the principal obstacles in the way of further progress in the investigation of the disease is the fact that there is really no satisfactory experimental animal other than man."

Wilson's address is accompanied by 27 splendid illustrations, beautifully reproduced, most of them photomicrographs, and dealing with trachoma, folliculosis, and spring catarrh.

The other papers included in the annual report are: by J. B. Hamilton of Tasmania on the prognosis of sarcoma of the choroid (geneological trees); by W. A. Fairclough on cataract in dystrophia myotonica; by Graeme Talbot on pterygium; by W. C. Burns on herpes ophthalmicus associated with chicken-pox; by C. A. Pittar on late results of successful operation for detached retina; by W. J. Hope-Robertson on the prevention of industrial eye accidents; by W. H. Simpson on penetrating wounds of the eye; by W. A. Fairclough on contact lenses; by L. S. Talbot on congenital dislocation of the lens; and by J. S. Munro on dislocation of the crystalline lens.

The New Zealand Society has 40 members, comprising practically all the ophthalmologists in the country.

W. H. Crisp.

HISTOLOGY AND HISTOPATHOLOGY OF THE EYE AND ITS ADNEXA. By I. G. Sommers, M.D., Los Angeles, California. New York, Grune & Stratton, 1949. Clothbound, 764 pages. Price, $12.00.

The book is divided into three parts. The first 53 pages are devoted to very brief discussions of the normal histology, embryology, and senescence of the eye.

The second part entitled "General pathology in relation to the eye" should stimulate the interest in ocular histopathology of the beginner who often finds this subject dry unless it is correlated with more familiar clinical and pathologic knowledge.

The third part deals with the specific histopathology of the ocular tissues. It contains a wealth of informative material but suffers acutely from the paucity of illustrations. Greater brevity in stating the essential pathologic findings of each condition in lieu of pages of flowing descriptions without highlights, would greatly facilitate, particularly for the beginner, the creation, at least, of mental pictures.

It is also disappointing that the author did not avail himself of more modern terminology and classifications, as for instance in the discussions of tumors and the glaucomas.

The book is difficult to read because of the innumerable "Germanisms" in expressions and grammar, which not only mar the elegance of style but also detract from the clarity of statements, making them not infrequently ambiguous.

The most valuable part of the book, at least in this reviewer's opinion, is the short digest of source material, and the pertinent bibliography which follows each chapter. Although of necessity incomplete, it should promote collateral reading and acquaint the reader, without confusing him, with various divergent opinions expressed in the literature.

Bertha A. Klien.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

1

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Fischer, Franz. **Embryonic properties of lens fibers.** Klin. Monatsbl. f. Augenh. **114**:202-205, 1949.

In larvae of salamandra maculosa in which the lens had been removed 70 to 120 days before histologic examination, the author found that primary lens fibers can grow unusually long and are only inhibited in this growth by the anterior wall of the lenticular vesicle. The epithelial wall of this vesicle and the pressure within it are the definitive factors in the normal development of the lens fibers. The developing fibers have the property of imitating the form of a lens without the influence of an external factor. (3 figures, references.)

Max Hirschfelder.

Vetter, Joachim. **Peculiar pigmentation in optic nerves and surrounding tissues of the globe in animals.** Klin. Monatsbl. f. Augenh. **114**:214-218, 1949.

The pigmentation of the region within and around the lamina cribrosa is very variable in different groups of animals as well as within the same group. The author examined the eyes of forty mammals and describes especially the pigmentation in camels (very fine pigmentation within the lamina mesh), in hyenas (coarse pigment) and in wapitis which show an unusual amount of pigment within the optic nerve along its sheats. This pigment is not related to the one found in the pigment layer of the retina. (3 figures, references.)

Max Hirschfelder.

2

GENERAL PATHOLOGY, BACTERIOLOGY, IMMUNOLOGY

Zollinger, R. **The occurrence of mast cells in iris and ciliary body.** Ophthalmologica **117**:249-252, April-May, 1949.

True mast cells occur in pathologic sections of the uvea of chronically inflammed human eyes. In small numbers mast cells can be found in many ocular conditions and in similar numbers in the aqueous.

Peter C. Kronfeld.

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Goldmann, H. **Do the aqueous veins contain aqueous?** Ophthalmologica **117**: 240-243, April-May, 1949.

Goldmann reports accurate fluorescein determinations made in blood and aqueous by means of an optical method with an accuracy of ±5.5 percent. With this method he found the fluorescein concentration of the plasma to be at least a hundred times greater than that of the aqueous during the first hour following the intravenous injection of fluorescein. The absence of fluorescence under these conditions proves conclusively that the aqueous veins do not contain blood plasma.

Peter C. Kronfeld.

Michiels, J. **Experimental study on the formation of the aqueous humor.** Ophthalmologica Supplement No. 34, 1949.

The static and dynamic chemistry of the aqueous is reviewed rather thoroughly. No clear concept of the function of the blood-aqueous barrier can be derived from the experimental data which are now available. The author has studied the appearance in and disappearance from the aqueous of gum arabic which he injected intravenously into rabbits in a solution of the same osmotic pressure and viscosity as that of blood. Between 50 and 100 cc. of the gum solution were injected at the rate of about 2 cc. per minute. Gum arabic entered the aqueous in measurable quantities, together with an abnormal amount of blood protein. Just as in studies by other authors, the intravenous injection of gum arabic was found to alter the permeability of the blood-aqueous barrier. It is unlikely that the gum itself exerted any chemical or toxic effect on the capillary wall. The colloidal state of the blood was changed very profoundly by the addition of the gum. Probably this changed physical status affected the capillary wall. The gum disappeared from the aqueous slowly and without having been broken down into smaller molecules since the rabbit does not possess any enzymes that break down gum arabic. No important conclusions concerning the elaboration of normal aqueous can be drawn from work of this kind.

Peter C. Kronfeld.

Schenk, Fritz. **Pharmacological effects upon the ocular tension of the rabbit.** Ophthalmologica **118**:42-65, July, 1949.

The effects upon the ocular tension of the drugs most commonly used in ophthalmology were studied on rabbits under urethane anesthesia. Fairly consistent fluctuations were observed after the instillation of atropine, hyoscyamine and scopolamine. An initial rise of from 1.5 to 4.5 mm. was followed by a drop of from 6.5 to 8 mm. The original level was reached after 3 to 4 hours. In 2 out of 26 rabbits the drop in tension was followed or superseded by a marked secondary rise. The instillation of cocaine caused fluctuations similar to those observed after atropine. Indifferent results were obtained after the intravenous injection of acetylcholine, methylene blue, caffeine and histidine. Ergotamine caused a slight drop in tension. In general, the administration of a large variety of drugs produced either no appreciable effects or a slight to moderate drop in tension. Whatever the experimental procedure is, the normal eye of the rabbit is more apt to respond with a drop than with a rise in tension. In a small number of rabbits the response is very different from that of the overwhelming majority. This exceptional behavior may be an expression of vasomotor or vegetative lability.

Peter C. Kronfeld.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Beach, S. J. **"Myopia cures."** Tr. Am. Ophth. Soc. **46**:284-294, 1948.

The author discusses some evidence consistent with the unorthodox theory that improvement in vision in nearsighted persons which follows sight train-

ing exercises may in some instances be due to a genuine reduction of the myopia. The feature of sight training courses that keeps the devotees faithful is the flashes of distinct vision they elicit. As it frequently is monocular and shifts from one eye to the other it cannot be ascribed to improved interpretation of blurred images on the cerebral level. It seems to be a development of the squinting used by myopes. Use of akinesis of the orbicularis and retrobulbar akinesis of the extraocular muscles might give a clue to whether pressure is exerted by the orbicularis or the extrinsic musculature.

David Harrington.

Blum, J. D. **The tolerance for contact lenses.** Ophthalmologica **117**:214-217, April-May, 1949.

A questionnaire was sent to fifty consecutive patients who had received molded plastic contact lenses and 86 percent reported that they are wearing their lenses for an average of nine hours every day. Peter C. Kronfeld.

Dufour, R. **Plastic contact lenses. Preliminary report.** Ophthalmologica **117**: 207-211, April-May, 1949.

This report from the University Eye Clinic of Lausanne deals with the results obtained with plastic molded contact lenses in 60 patients with varying ocular conditions. The lenses are constructed to admit a capillary layer of tear fluid between cornea and contact lens, either through an area of clearance nasally and below or through multiple channels in the scleral portion of the lens. Sixty percent of the patients are satisfied with the lenses and wear them regularly. In several cases of qualified success or failure, the fitting process has not been completed. One retinal detachment occurred coincidentally during the fitting process. The author's conclusions and experiences do not differ significantly from those of the American ophthalmologists.

Peter C. Kronfeld.

Handmann, M. **Myopia after inflammatory diseases in the anterior part of the bulbus.** Klin. Monatsbl. f. Augenh. **114**:224-233, 1949.

Factors of inheritance are the main cause in myopia. However, there are instances of myopia which cannot be ascribed to inheritance. The author describes the case histories of 14 patients who had unilateral myopia as a late result of dendritic, parenchymatous and eczematous keratitis. Amblyopia was frequently associated with the nearsightedness which developed over the course of many years. The author believes that inflammatory processes of the cornea may influence the metabolism, growth and tissue stability of the sclera as a whole. (References.) Max Hirschfelder.

Knuesel, O. **Further experiences with contact lenses.** Ophthalmologica **117**:212-213, April-May, 1949.

The author stresses the nonspherical surface of most human eyes. He measures the curvature of the sclera in several meridians and constructs the contact lens on the basis of these measurements. Accurate fitting of the scleral portions is the most important factor in the success of a contact lens. Corneal edema is usually due to one or two tight areas or a very tight fit of the entire scleral portion. The composition of the contact lens solution is of no significance. One patient is equally comfortable with well water or apple cider. Peter C. Kronfeld.

Lancaster, W. B. **Some secondary subjective effects produced by prisms.** Tr. Am. Ophth. Soc. **46**:262-283, 1948.

The various optical distortions produced by prisms can be explained on the

basis of the obliquity of incidence of the rays in two significant planes, the base-apex plane and a horizontal plane. The author's explanation of the obliquity is offered as a new contribution to the subject. When a prism is cut at right angles to the base and to the sides, the cross section is a triangle of minimum base and minimum apical angle. When it is cut obliquely, but still at right angle to the base, the triangular cross section has a longer base, a larger apical angle and more power to cause deviation.

David Harrington.

5

DIAGNOSIS AND THERAPY

Alden, H. S., Jones, J. W., and Rankin, J. **Roentgen-ray treatment of the eye.** Arch. Derm. and Syph. **59**:430-434, April, 1949.

For 15 years the authors have used roentgen rays on 300 patients with corneal ulcer. A method is described whereby the cornea can be prepared and 160r per minute applied to it. The average dose used is 70 to 80r at weekly intervals for five treatments. Tissues that receive less than 300r usually recover while tissues that receive 1500r or more do not recover from damage caused by the rays. Of 159 patients treated before 1943 the average dose was 252r. Over 60 percent of these have been examined with the slit lamp and show no changes in the lense. One patient who had received other X-ray therapy for a resistent blepharitis had some slight lenticular opacities.

H. C. Weinberg.

Amsler, M., and Verrey, F. **Injections of pencillin and adrenalin into the anterior chamber.** Ophthalmologica **117**: 243-246, April-May, 1949.

Penicillin, 300 to 400 units dissolved in 0.2 cc. of 2-percent procaine, plus a small amount of adrenalin is injected into the anterior chamber immediately after most of the contents have been withdrawn by means of a hypodermic needle and syringe in cases of serpentic ulcer, endogenous acute and chronic uveitis, perforating injuries, and intraocular foreign bodies. Results were on the whole good, at times almost miraculous, and other times nil. Injected into the anterior chamber, epinephrine is a powerful mydriatic.

Peter C. Kronfeld.

Badtke, G. **Treatment of the eye with supersonic stimuli.** Klin. Monatsbl. f. Augenh. **114**:193-196, 1949.

Space and time difference of a wave have the physical effect of a massage of cells or cell groups. Local rise in temperature and stimulus of diffusion and penetration of fluids follow supersonic treatment. Therapeutic doses are too weak to damage the tissues by rupture and hemorrhage. The therapeutic dosage ranges up to 3.0 Watt per ½ cm.^{2} Two stubborn cases of vitreous opacities after intraocular hemorrhage showed improvement after treatment with the ultrasonator and an incompletely absorbed chalazion responded to treatment. Experiments with rabbits eyes failed to reveal any damage to the tissues.

Max Hirschfelder.

Balcet, C. **The use of novocaine in oil in ophthalmic practice.** Rassegna ital. d'ottal. **18**:44-47, Jan.-Feb., 1949.

Two-percent novocaine in almond oil has great advantages over the use of the aqueous solutions. The results of injection are practically uniform in effect. Anesthesia of the skin begins almost immediately and persists for 24 to 36 hours. Akinesia of the orbicularis appears within two minutes and lasts for six to eight days. The edema is slight and remains for only 24 to 36 hours. There are no subjective or objective disturbances and no tendency to produce ptosis or ectropion.

Retrobulbar injection of the oily solution results in more prolonged anesthesia and was used in cataract extractions and filtering operations for glaucoma. There is a striking difference in the action of the oleous solution on motor nerve fibers and sensory. The former are more profoundly and longer effected. Eugene M. Blake.

Dupont, M. **The signs of syphilis or hereditary syphilis.** Ann. d'ocul. **182**:295-300, April, 1949.

The clinical signs of acquired and congenital syphilis are compared with those of tuberculosis to facilitate more accurate ophthalmologic differential diagnosis. A familiarity with the extraocular evidences of syphilis is often of great value in differentiating ocular syphilis and tuberculosis.
Chas. A. Bahn.

Gát, L. **The technique of evisceration.** Ophthalmologica **117**:343-346, June, 1949.

The evisceration of the globe has not been more widely accepted because of the danger of sympathetic ophthalmia and the slow and rather painful convalescence. The author removes the cornea completely by means of scissors and the ocular contents by means of a curette. The cavity is packed for two to five minutes to obtain complete hemostasis and is then thoroughly inspected for remnants of uveal tissue. After the internal surface of the sclera has been found to be perfectly clean and dry the cavity is filled with two or three grams of ultraseptyl, a sulfonamide, and the anterior opening is closed with interrupted sutures. Chemosis usually lasts less than four days.
Peter C. Kronfeld.

Goldmann, H. **Biomicroscopic findings in the chamber angle and in the eyeground.** Ophthalmologica **117**:253-258, April-May, 1949.

The author describes and demonstrates in beautiful drawings some unusual gonioscopic findings. His contact lens can be used to a great advantage in the study of fundus lesions. The important question whether small lesions are located in the outer retinal layers or in the lamina vitrea can be decided by slit lamp examination through Goldmann's contact lens.
Peter C. Kronfeld.

Morano, M., and Franchi, E. **Plesio-roentgen therapy of ocular diseases.** Ophthalmologica **118**:30-41, July, 1949.

The term plesio-roentgen therapy implies a special form of X-ray therapy. It is essentially a low voltage contact method in the development of which Chaoul has played an important part. The X-ray tube which is used in this work is designed by and named after him. In this paper beneficial results from this form of radiation are reported in tuberculous uveitis, localized, solitary chorioretinitis, deep keratitis and in some corneal ulcers. The doses were calculated to produce a series of biological effects which cause an increase of the vital power of the affected ocular tissues with following accelerations of the natural recovery process. Special care was taken to get a localized X-ray effect within the diseased tissue and a minimum of undesirable stray effect. Peter C. Kronfeld.

6

OCULAR MOTILITY

Fink, W. H. **The surgical anatomy of the superior oblique muscle.** Tr. Am. Ophth. Soc. **46**:154-184, 1948.

The superior oblique muscle, the trochlea, the reflected tendon and the insertion and such adjacent structures as the septum orbitale, the levator muscle, the superior rectus muscle, the nerves and blood vessels, and the various fascial membranes are described from the viewpoint of both the anatomist and the surgeon. Surgical procedures are limited to the re-

flected tendon and its insertion. Approaches to this area are discussed.

David Harrington.

Key, S. N., **Orthoptics without instruments.** Texas State J. Med. **45**:146-148, March, 1949.

Two methods are described as supplemental to, or in place of the usual orthoptic training, a red filter which can be reduced in density, and bar framing exercises. Donald T. Hughson.

Pascal, J. I. **A static and dynamic muscle scheme.** Opthalmologica **117**:217-221, April-May, 1949.

To facilitate the study of ocular muscle disorders, Pascal has devised a scheme in which the extraocular muscles are placed at the midpoints of the sides of a hexagon which is thought to be located in front of each eye. Proceeding clockwise from the 9-o'clock position, the arrangement of the muscles of the right eye on its hexagon is as follows: lateral rectus, superior rectus, inferior oblique, medial rectus, superior oblique, inferior rectus. The arrangement of the muscles of the left eye within its hexagon is the exact mirror image of that of the right eye. Such a scheme illustrates a great many physiologic as well as pathologic phenomena of ocular motility. Peter C. Kronfeld.

7

CONJUNCTIVA, CORNEA, SCLERA

Castroviejo, R. **Keratoplasty for the treatment of keratoconus.** Tr. Am. Ophth. Soc. **46**:127-153, 1948.

From a thorough review of the literature on the surgical treatment of keratoconus and his own experience, the author concludes that the partial penetrating type of keratoplasty is the treatment of choice for advanced keratoconus. The preoperative study, technical details and minutiae which must be observed at the time of operation, methods of suturing the graft and postoperative care are described, and the prevention of anterior synechia and their treatment when they occur, retransplantation after clouding of the graft, and use of radiation in the prevention of vascularization are discussed. (Photographs and drawings.)

David Harrington.

Heinsius, Ernest. **Involvement of the cornea in agranulocytosis.** Ophthalmologica **118**:69-75, July, 1949.

The author reports a case of a severe, ulcerative, rapidly-progressive keratitis which for six days had been treated very inadequately at the patient's home. Most of the cornea was involved and a hypopyon filled more than the lower third of the chamber. During the first five days in the hospital the treatment consisted of atropine instillations, yellow oxide of mercury and optochine locally, and milk injections intramuscularly. Under this regime the corneal process became worse. Five days later penicillin treatment was started locally and systemically, and two days later a conjunctival flap was placed over the cornea. The corneal process began to regress but the patient's general condition was unsatisfactory and agranulocytosis was found which responded well to blood transfusions. The patient made a slow recovery. At the time of discharge the affected eye could count fingers at a short distance. The agranulocytosis might have been brought on by some analgesic such as amidopyrine, which the patient received early, but the author suggests that the patient had agranulocytosis from the beginning and that the corneal ulcer was just one of its manifestations.

Peter C. Kronfeld.

Jirman, J. **Physiologic treatment of certain corneal lesions.** Ann. d'ocul. **182**: 449-454, June, 1949.

Corneal healing depends largely upon the diffusion and osmosis of its nutritive substances. In the treatment of corneal burns and neuroparalytic keratitis the author had used amino acids, including a 2-percent glycocol solution and hemolized blood serum locally with intramuscular injections of 2 to 4 cc. histadine. He also uses antibiotics and irrigates with Ringer's solution. Six severe cases of corneal burns from acetone, potassium hydrate, hot iron, lime and methylene blue were treated by this method, and three of neuroparalytic keratitis. The results recorded were surprisingly favorable. There was very little loss of vision.
Chas. A. Bahn.

Paufique, M. and Etienne, R. **The conjunctival-ganglion syndrome of Parinaud.** Ann. d'ocul. **182**:455-460, June, 1949.

The case reported was the result of infection with blastomyces in a 32-year-old woman. The intradermal reaction of a lysate of Rodo turula was strongly positive and she had an eosinophilia of 15 percent. Potassium iodide was administered by mouth, but did not prevent gland suppuration. Chas. A. Bahn.

Stein, A. **The therapy of serpentic ulcer.** Ophthalmologica **117**:227-230, April-May, 1949.

Maintenance of a high local concentration of antibiotics is essential in the treatment of serpentic ulcers. The author reports favorable results with penicillin baths applied to the cornea for as long as six hours by means of a rubber eye cup with adjustable rim. The penicillin concentration of the bath varies from 2,000 to 4,000 Oxford units per cc. of fluid. In severe cases these baths are administered day and night with only short rest periods every six hours. A similar eye cup is used for iontophoresis. In Switzerland serpentic ulcers are apparently still fairly common and are caused by pneumococci or staphylococci.
Peter C. Kronfeld.

Varley, R., and Kletz, T. **A case of Kaposi's varicelliform eruption (systemic herpes simplex) with dendritic ulceration of the cornea.** Brit. J. Derm. and Syph. **61**:166-169, May, 1949.

A five-year-old girl with multiple umbilicated vesicular lesions over the face developed a typical dendritic ulcer of the cornea four days after admission. Kaposi's varicelliform eruption and dendritic keratitis are discussed as different phases of sensitization to the virus of herpes simplex. H. C. Weinberg.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Remky, Hans. **The diagnostic significance of chorioditis in retinitis albuminurica.** Klin. Monatsbl. f. Augenh. **114**: 233-238, 1949.

Disseminated pigmented chorioditis-like spots developed in three patients with advanced albuminuric retinopathy. The eyegrounds resembled each other, even though the clinical diagnosis was malignant nephrosclerosis in one and secondary contracted kidney and endangiitis obliterans in the other two. The fundus findings are described in the literature as chorioditis albuminurica and are caused by endangiitic and necrotic vascular processes in the choroid. The finding points to a most severe vascular disease and usually means a poor general prognosis. (References.) Max Hirschfelder.

9

GLAUCOMA AND OCULAR TENSION

Christensen, L., and Swan, K. C. **Adrenergic blocking agents in the treatment of glaucoma.** Tr. Am. Acad. Ophth. pp. 489-498, May-June, 1949.

Two new drugs of the adrenergic blocking group are analyzed and their results reported in 18 consecutive cases of acute glaucoma which did not respond to other treatment. These drugs are Dibenamine N-N-dibenzyl-B-chlorethylamine hydrochloride), and SKF #194 (N-B-chlorethyl - N - benzyl - B - phenyl - isopropylamine hydrochloride). Dibenamine, a tissue irritant, is injected intravenously in doses of 4 to 5 mg. per kilogram of body weight. Because of its possible effect on the cardiovascular system, especially in hypertensive patients, bed rest for 36 hours is desirable after its use. Dibenamine causes miosis by relaxing the iris dilator. The immediate decrease of ocular tension ranged from 11 to 40 mm. This action is not altered by mydriatic or cycloplegic drugs. In several patients, repeated doses of Dibenamine were administered at intervals of several days. The hypotensive action of the drug decreased with subsequent use. It is not yet known whether supplementary local treatment influences the hypotensive effect of Dibenamine. SKF #194, is closely related to Dibenamine physiologically. In animals' eyes it is more effective than Dibenamine, but it has not yet been used in human eyes.

Chas. A. Bahn.

Esente, I. **The Bloomfield-Lambert test on normal, glaucomatous, and hypertensive individuals.** Boll. d'ocul. **28**:77-90, Feb., 1949.

In the Bloomfield-Lambert lability test, pressure of 60 to 70 mm. Hg is applied for one minute and simultaneously one hand is immersed in ice-cold water. If the intraocular pressure exceeds 30 mm. Hg or if there is an increase of more than 9 mm. in the original tension, the test is positive for glaucoma. To evaluate the test clinically and to elucidate its mechanism the authors examined normal and glaucomatous patients without and with previous administration of corticodiencephalic depressor drugs, and persons with generalized arterial hypertension. In 20 normal persons, the test provoked increases in tension no greater than 7 mm. Hg accompanied by increase of the retinal arterial diastolic pressure to values which sometimes exceeded the normal by 20 mm. Hg. Administration of barbiturates did not markedly influence the results although a slight decrease of tension and intravascular retinal pressure was often observed. In 13 patients with glaucoma, barbiturates had little influence on the tension. In three patients with acute glaucoma, the test provoked an increase of intraocular pressure of 2 to 4 mm.; the diastolic arterial pressure in the retina of two of these patients increased slightly and decreased in one. This in spite of a 20 mm. increase of the brachial arterial pressure. In one patient with chronic simple glaucoma, the test was followed by a 5 mm. decrease of tension while the pressure in the brachial artery remained unchanged. In three eyes successfully operated on for acute glaucoma and with tension below 30 mm. Hg the test provoked tension increases of less than 9 mm. Hg and increase of the retinal arterial pressure of 6 to 12 mm. Hg. In the normal eyes of two patients with unilateral juvenile glaucoma and with tension below 25 mm. Hg, the test raised the tension by 10 mm.

Twenty-two persons suffering from general arterial hypertension were tested. In 12 of these patients, a decrease of the brachial artery pressure and an increase of both the tension and the arterial diastolic pressure was found; usually the test provoked an increase of all values. In a group of patients with exophthalmic goiter there was dissociation of the values measured. The Bloomfield-Lambert test increased the tension and reduced the intraocular arterial pressure.

Esente believes that both interpretations of the Bloomfield-Lambert test are

justified, that of Bloomfield and Lambert who consider it a measure of a local reaction to general pressure changes, and that of Magitot for whom it is a typical example of thalamic irritation. The clinical value of the test is not diminished by its complicated and not fully understood mechanism. K. W. Ascher.

François, J. **The aqueous veins after iridencleisis.** Ann. d'ocul. **182**:169-176, March, 1949.

The aqueous veins of Ascher which go to form the laminary veins of Goldman definitely contain aqueous and act as valves, especially if the ocular tension is increased. Iris inclusion operations on 61 eyes are reported. Aqueous veins were present in 52 percent as compared with 96 percent of normal eyes. Forty-three eyes with iris incarceration were studied. Aqueous veins were observed in 12 of 19 eyes with filtering cicatrix and in 6 of 24 eyes with closed angles. Of 18 eyes with flat cicatrix, 9 had open angles and of these 8 had aqueous veins and of the 9 with closed angles 5 had aqueous veins.

Chas. A. Bahn.

Inciardi, J. A. **Aids in the diagnosis of glaucoma.** New York St. J. Med. **49**:836-838, April 1, 1949.

Inciardi says that it rests largely upon the general practitioner whether we shall have a small or a large number of persons blind from glaucoma. A large percentage of patients are likely to be seen first by him. There are approximately 200,000 blind persons in the country of which 20,000 are blind from glaucoma. Inciardi describes the symptoms of glaucoma and points out that unbearable pain after occlusion of the central vein means glaucoma and that secondary glaucoma has probably intervened if an eye with cataract suddenly becomes painful. The possibility of increased intraocular pressure is to be considered if an ocular injury is followed by congestion, pain, blurred vision, or steamy cornea, or if an eye with uveitis develops increased redness, pain, visual disability and steamy cornea.

Theodore M. Shapira.

Posner, A., and Schlossman, A. **Role of inheritance in glaucoma.** Arch. Ophth. **41**:125-150, Feb., 1949.

Although the importance of heredity in the pathogenesis of glaucoma is often stressed, only about 90 pedigrees of families with glaucoma have been reported. The authors found that of 373 unselected cases of glaucoma in private practice, 51, or 13.7 percent, showed familial tendencies. In most families the disease follows a similar course in the various affected members. The pedigrees of 27 families are given; all but one showed dominant heredity. The genetic approach may be an aid in the early recognition of glaucoma and in the study of the preclinical and mild phases of the disease.

John C. Long.

Ullman, E. V., and Mossman, F. D. **Glaucoma and orally administered belladonna.** Northwest Med. **48**:245-246, April, 1949.

Six cases of glaucoma clearly induced or aggravated by the internal use of a belladonna drug are reported. Five of the six eyes had narrow filtration angles. Of all prescriptions filled in local pharmacies 10 percent of those not by ophthalmologists contained belladonna in some form. The seriousness of this often-overlooked factor in glaucoma is emphasized.

Orwyn H. Ellis.

Verrey, F. **The behavior of the ocular tension after puncture of the anterior chamber.** Ophthalmologica **117**:246-248, April-May, 1949.

At the University Eye Clinic of Zurich

the staff has been interested in the use of the anterior chamber puncture as a diagnostic procedure for a number of years. In a thesis by Strassman these studies will be reported in detail. About 2,500 punctures have been performed on patients. With very few exceptions the effects on the ocular tension are brief. In inflammatory disease the author has never observed an appreciable hypertensive reaction; on the contrary, most of the cases of chronic uveitis of long standing respond with hypotension for twenty-four hours. In hypertensive non-inflammatory disease with increased tension the hypertensive reaction after puncture varies a great deal. The authors could not confirm Kronfeld's view of the value of the anterior chamber puncture as a diagnostic test for certain glaucomas. In one of their patients acute glaucoma was precipitated, but the eye responded promptly to eserine In two cases of noninflammatory glaucoma the tension was normalized for several days by the puncture. In the hypertensive inflammatory ocular conditions the immediate reaction to the puncture varies much more than in any of the other groups. In one case of cyclitis with heterochromia the puncture precipitated an acute attack which was terminated by an iridectomy. In about ten cases of this inflammatory hypertensive type the ocular tension was normalized by puncture for several days to several months. The authors believe that paracentesis is not a method of treatment for simple glaucoma or for secondary hypertension except in a few unusual cases but it can render the service of a preoperative or postoperative temporary decompression operation. Complications are rare (2 in 2,500 cases). Puncture is definitely contraindicated in hemorrhagic absolute glaucoma. Slight and brief fluctuations of ocular tension may be observed in the other eye. Peter C. Kronfeld.

Verrey, F. **The transconjunctival cyclodiathermy after Weekers.** Ophthalmologica **117**:**281,** April-May, 1949.

The University Eye Clinic of Zürich, where Vogt in 1935 first advocated cyclodiathermic punctures, has apparently given up this operation during the last few years and has adopted the transconjunctival nonperforating technique of Weekers. A flat electrode, 0.8 mm. in diameter, is applied to the sclera through the conjunctiva, 7 mm. from the limbus. Over the entire circumference of the globe 18 to 20 coagulations are made in one sitting. A pyrometric eletrode is used which permits accurate measurement of the amount of heat applied. The current is turned on and gradually increased so as to reach a temperature of 90° C. in 3 to 5 seconds. This temperature is maintained for from 10 to 15 seconds. At the end of the operation the ocular tension is always markedly increased. This rise of tension can be alleviated either by a puncture of the anterior chamber or irrigation of the surface of the eye, between the coagulations, with a cool (35°C.) saline solution. The author has used this operation in 30 eyes of which 4 had infantile glaucoma, 2 juvenile, 8 acute or hemorrhagic, and 11 secondary glaucoma. The number of permanently successful operations is not stated. Peter C. Kronfeld.

Weekers, L., and Weekers, R. **Non-perforating cyclodiathermy.** Ann. d'ocul. **182**: 188-198, March, 1949.

The author considers iridencleisis the operation of choice in almost all primary glaucoma. With it tension was normalized in 96 percent of eyes with chronic glaucoma, in 93 percent with subacute, and in 85 percent with acute glaucoma. If tension persists after iridencleisis, nonperforating cyclodiathermy is considered preferable to cyclodialysis and other operations, because it is more effective,

simpler and less painful. Ten cases of such secondary cyclodiathermy are described. Chas. A. Bahn.

Weekers, L. and Weekers, R. **The physiopathological foundation and the technique of the iris inclusion operation.** Ophthalmologica **117**:305-324, June, 1949.

"Iridencleisis appears to be destined to occupy the first place among the antiglaucomatous operations." On the basis of their own observations the authors do not consider the iridencleisis to be a filtering operation. A filtering scar, if it should develop after iridencleisis, is of only secondary importance. The paper consists of three parts: 1. the mechanism of the normalization of tension after iridencleisis, 2. the importance of the postoperative scar on the surface of the globe, and 3. the effect of the operation upon the function of the aqueous veins. In the hands of the authors the iris inclusion operation is successful in 96 percent of the chronic glaucomas, in 93 percent of the subacute, in 85 percent of the acute glaucomas, and in 70 percent of secondary. The criterion of success is an ocular tension below 25 mm. Hg (Schiøtz, 1924). Especially in the subacute and in the acute glaucomas the iridencleisis, if successful, causes the ocular tension to return to normal, that is, to the range between 17 and 24 mm. In the chronic glaucomas the postoperative tension varies within somewhat wider limits. If the distribution of postoperative tensions in glaucomatous eyes is compared with the distribution of ocular tension in normal eyes, almost identical curves are obtained. The diurnal variations of ocular tension were studied in two cases of bilateral chronic glaucoma several months after successful iridencleisis on one eye. The operated eyes still described typical diurnal variations though on a very much lower level than the unoperated eye. The Seidel test has been almost invariably negative. No relationship could be found between the size of the scar and the ocular tension. In the cases with markedly bullous or cystic scars the tension was definitely lower. In these cases the authors admit the possibility of fistulization as a possible auxiliary but not indispensable factor. Averse to the theory of fistulization, the authors consider two other possibilities whereby a bullous scar could account for a lower ocular tension. The proximity of the bullous scar might modify the elasticity of the cornea and thereby introduce a "false" reading. The cystic cavity of the bleb with its watertight partitions might also represent a decompression chamber of greater or lesser elasticity and thereby influence the ocular tension. The important fact that very often the operative scars are flat in the presence of normal ocular tensions seems to exclude filtration altogether. The principal mode of action of iridencleisis is a different one.

Marked lowering of the ocular tension by the iridencleisis reduces the number of visible aqueous veins which are direct outlets of the trabecula and canal of Schlemm. The authors consider the latter as just an auxiliary system to the venous system of the anterior uvea which plays the preponderant role in the resorption of the aqueous. After a successful iridencleisis, this auxiliary system is not needed and it is for that reason that some of the aqueous veins disappear.

The technique of iridencleisis as practiced by the authors is described.

Peter C. Kronfeld.

Weinstein, Paul. **The treatment of glaucoma with furmethide and di-isopropylfluorophosphate.** Ophthalmologica **118**:76-79, July, 1949.

During his recent trip to the United States, Weinstein observed the results

obtained with furmethide and DFP. On a group of glaucoma patients, in Budapest, he made and now reports observations similar to those reported by Uhler (Amer. J. of Ophth. **26**:17, 1942) and by Leopold (Arch. of Ophth. **35**:1, 1946).

Peter C. Kronfeld.

10
CRYSTALLINE LENS

Denig, Rudolph. **Early and late sequelae of the discision of congenital nuclear cataract and its variations.** Klin. Monatsbl. f. Augenh. **114**:197-202, 1949.

The author discusses the dangers of discision in the treatment of congenital nuclear cataract and points to the damaging effect of lenticular remnants on the uveal tract. The frequent occurrence of late detachment of the retina after such discision is another result of the damage to the uveal tract and retina by lens protein. One of the author's patients developed a trophoneurotic damage of the corneal epithelium. Denig advocates optic iridectomy in suitable cases, or loop extraction. He prefers the slight loss of vitreous to the complications following a discision. (References.)

Max Hirschfelder.

Fanta, H. **Cataract formation after Elliot's trephining and Holth's iridencleisis.** Arch. f. Ophth. **148**:643-657, 1948.

The formation of cataract, which was more frequent after Elliot's operation, can be more probably ascribed to postoperative iritis, rather than to postoperative hypotony. Ernst Schmerl.

Harrington, D. O. **The mechanics of intracapsular cataract extraction.** Tr. Am. Ophth. Soc. **46**:294-317, 1948.

The fundamental physical principles underlying the dislocation and intracapsular delivery of the lens is discussed. It can be demonstrated by slit lamp microscopy, by gonioscopic observation, during actual intracapsular cataract extraction on the living eye, on animal eyes and on human cadaver eyes, that the rupture of the zonular lamella of the lens is accomplished primarily by the production by external pressure of a wedge of vitreous tissue which is made to insert itself between the equator of the lens and the ciliary processes. The deformity of the vitreous can be produced at whatever site is desired. The normal vitreous is a tissue and cannot be considered as a fluid in which pressure at one point is transmitted equally to all other parts. Certain safety factors in intracapsular cataract extraction may be reevaluated in the light of these basic principles.

David Harrington.

Jorio, A. **Two cases of cataract associated with skin diseases.** Rassegna ital. d'ottal. **18**:17-33, Jan.-Feb., 1949.

The author discusses the various characteristics of syndermatic cataracts and reviews the literature on this rare condition. The first patient demonstrated the effects of the Rotmund-Werner syndrome, and in the second the syndrome of Sjögren was added to this. The latter association is the first reported in the literature. From the clinical examination and laboratory findings the writer considers the cause to be an endocrine dysfunction of the genital glands and other glands of the endocrine system may participate. (6 figures.) Eugene M. Blake.

Jaeger, A. **Collapse of the sclera after cataract surgery.** Klin. Monatsbl. f. Augenh. **114**:148-151, 1949.

The sclera may sink in after lens extraction because of loss of an unusual amount of anterior aqueous with a deeply situated subluxated lens, or posterior aqueous with seclusion of the pupil or loss of vitreous. The condition corrects itself, if the loss is not too great. The

problem of proper closure of the wound is discussed. It is not difficult, if the collapse involves the region of the insertion of the muscles. In the region of the ciliary body it prevents the coaptation of the edges of the section. If one avoids too much tension in suturing the conjunctival flap, the incongruence will correct itself in a few days. Max Hirschfelder.

Knüsel, O. **Electric cataract.** Ophthalmologica **117**:299, April-May, 1949.

The case of a thirteen-year-old boy who developed a cataract in his left eye one year and in his right eye six years after electric shock illustrates the greatly variable latent period of electric cataract.

Peter C. Kronfeld.

Papolczy, F. **Statistical data of my cataract operations performed with a new suture of the sclera.** Brit. J. Ophth. **33**: 296-305, May, 1949.

A new suture is presented which has been used with good success in 325 cases. A 6-0 black nylon suture is placed through the conjunctiva and sclera parallel to the limbus and 1 mm. above it at 12 o'clock. Section is made with a knife and brought to the suture. A conjunctival flap is made with scissors and brought down over the cornea. A round pupil and intracapsular delivery are then accomplished and the wound closed with the single preplaced suture.

Morris Kaplan.

Perera, Chas. A. **A simple appositional suture in operations for cataract.** Tr. Am. Ophth. Soc. **46**:184-191, 1948.

A suture is described which is placed after keratome incision and before scissors enlargement of the wound. The exact approximation of the wound edges results in accurate closure, rapid reformation of the anterior chamber and only one iris proplapse in 100 cases.

David Harrington.

Sedan, J., Levrat, M., and Paufique, L. **Petechiae test in diabetic cataract.** Ann. d'ocul. **182**:177-187, March, 1949.

The test is made by applying a sphygmomanometer cuff to the upper arm which is inflated to the maximum arterial tension less 2 cm. and left for five minutes. If the test is positive, petechiae appear, and are recorded as +1 to +4 on the basis of their size and number. A positive test indicates a probable retinal vascular degeneration and probable unfavorable visual prognosis for cataract extraction. The petechiae on the arm are considered an index to probable hemorrhages in the retina. Twenty-nine cases are briefly discussed to illustrate the value of this test which the authors believe should be more widely used to determine the risks of cataract extraction in diabetics.

Chas. A. Bahn.

11

RETINA AND VITREOUS

Blanchi, G. **Angioneurotic degeneration of the macula.** Rassegna ital. d'ottal. **18**: 34-43, Jan.-Feb., 1949.

The retinal alterations consisted of constriction of retinal vessels and of fine, and originally, limited pigmentation of the macular region. Early, active treatment with vasodilators and vitamin B resulted in but moderate improvement. Further studies of the circulatory system will probably confirm the opinion that there is an angioneurotic factor as in the three cases reported. Study of the endocrine functions, particularly of the hypophysis and the diencephalic centers, may prove the importance of this region in the regulation of the cerebral and retinal circulation. Eugene M. Blake.

Bruna, F. **Ocular complications in Werlhof's disease (essential thrombopenia).** Boll d'ocul. **28**:41-56, Jan., 1949.

Few cases of eye involvement in Werl-

hof's disease have been described. Bruna observed a 16-year-old girl with lesions similar to retinitis proliferans in the region of the optic disc and with pigment rarefication in the macula of both eyes. Werlhof's disease was the probable cause. (References.) K. W. Ascher.

Candian, B. **The fundus oculi of the newborn.** Rassegna ital. d'ottal. **18**:3-16, Jan.-Feb., 1949.

The eyegrounds of 35 babies were examined in mydriasis within a few hours to three days after birth. Twenty-six showed pallor of the disc, in six it was of reddish hue and in three intermediate in color. Retinal hemorrhages were observed seven times, papilledema six times, and in only two was the refraction emmetropic. Hypermetropia of two to eight diopters was measured with the ophthalmoscope.

A table gives many details of each case examined and three excellent colored plates depict the peripheral palor of the fundus and of the disc and the various types of retinal hemorrhage. A good bibliography accompanies the article. (4 figures, references.) Eugene M. Blake.

Carreras Matas, B. **A conception of tapetoretinal degeneration.** Arch. Soc. oftal. hispano-am. **9**:265-279, March, 1949.

A review of the literature and several personal observations led the author to believe that the mutation which deprives the cells of the sensory retinal epithelium and the pigment epithelium of essential elements, is the cause of tapetoretinal degenerations. The clinical implication of this theory leads to therapeutic attempts with drugs which stimulate the circulation of the choriocapillaris and provide abundant nutrition for the external layers of the retina, and with those which regulate the neurovegetative system and normalize the function of the glands of internal secretion. The intense vitamin therapy and tissue therapy after Filatov may be tried. The retina should be protected from bright light, which may be within safe limits for normal eyes but is excessive for degenerate eyes.

Ray K. Daily.

Costi, C. **Posterior detachment of the vitreous and rupture of the hyaloid.** Arch. Soc. oftal. hispano-am. **9**:390-396, April, 1949.

In two patients, 44 and 24 years old, both emmetropic, and with history of trauma, anterior vitreous opacities indicated the presence of uveitis. The ophthalmoscopic appearance of the detachment and perforations in the hyaliod membrane are described in detail. The pathogenesis is discussed, and the author believes that a primary uveitis leads to a thickening of the hyaloid membrane, which, losing its elasticity, is easily torn, through slight trauma or effort. The degenerated and liquefied vitreous insinuates itself through the hole, in the same manner that it does in retinal ruptures. It is believed that improved exploration of the hyaloid membrane will reveal that ruptures in it are not as rare as is supposed. (3 figures.) Ray K. Daily.

Czukrasz, Ida. **A Case of branch embolism of the central retinal artery.** Ophthalmologica **118**:66-68, July, 1949.

A nurse, 26 years of age, presented herself in the eye clinic one hour after a spontaneous blackout of her left eye. The right eye was found to be normal, the left eye presented the picture of an embolism of the inferior papillary artery. The vision was reduced to light perception. Thorough examination revealed no other circulatory or cardiac abnormality. The patient was treated chiefly with a vasodilator of the acetylcholine group called stabilocholin which was used retrobulbarly and subcutaneously. She was also given several inhalations of amyl nitrite

and a paracentesis was done a few hours after the blackout. The vision improved gradually. Five days after the onset the patient was discharged from the clinic with a visual acuity of 5/8 and a moderate constriction of the upper half of the field.

Peter C. Kronfeld.

Delaney, A. J., and Rhoades, A. L. **Angioid streaks of the retina, report of a case.** U. S. Naval Med. Bull. **49**:296-299, March-April, 1949.

A case of angioid streaks of the retina is presented, because of its rarity and its varied and apparently unrelated associated clinical findings. At the time the paper was written no evidence of pseudoxanthoma elasticum appeared in the patient. Lesions in the mouth similar to pseudoxanthoma elasticum proved to be Fox-Fordyce disease. There was no X-ray evidence of bony change suggestive of Paget's disease, sometimes an associated finding. Theodore M. Shapira.

Duke-Elder, Stewart. **The relation between peripheral retinal cysts and dialyses.** Brit. J. Ophth. **33**:388-389, June, 1949.

The author reports a case of a retinal cyst in the extreme periphery. Six months later it had doubled in size and extensive dialysis of the retina was now present. Diathermy was performed with successful reattachment. Orwyn H. Ellis.

Esente, Ivan. **The clinical and pathogenetic aspects of Purtschers's and Berlin's retinitis (commotio retinae).** Arch. di ottal. **52**:195-217, July-Aug., 1948.

The author discusses these two forms of traumatic retinal disturbances. The former, retinal contusion following indirect trauma to the bulb, was described by Purtscher in 1910 and called "angiopathia retinae traumatica." The latter, called "commotio retinae" arises from direct injury to the eyeball and was described by Berlin in 1874. Experiments carried out on rabbits and dogs under general anesthesia, showed an absence of the ocular signs typical of Purtscher's retinitis. These results are not sufficient to modify the author's theory that Purtscher's disease is an angioneurotic retinitis from indirect trauma.

Francis M. Crage.

Fajardo, R. M. **Congenital macular displasia associated with ocular anomalies.** An. Soc. mex. de oftal. **22**:310-315, 1948.

The lesion was associated with persistence of the hyaloid artery and prepapillary membrane; the possibility of choroiditis about the seventh or eighth month of intrauterine life is suggested. (2 figures, references.) W. H. Crisp.

Franceschetti, A., and Balavoine, C. **The prevention of retinal detachment by surgical therapy.** Ophthalmologica **117**: 259-263, April-May, 1949.

A question of when and how to subject retinal tears without detachment to surgical therapy has been discussed repeatedly at the meetings of the Swiss Ophthalmological Society. Weber recommended such surgical treatment in the presence of the following "unfavorable factors": detachment in the other eye, location of the tears in the upper quadrants, progressive degeneration of the retina, myopia, and hereditary tendencies. To these the authors add two other factors, namely the patient's age, and poor visibility of the fundus sector in which a detachment is most likely to occur. The authors have found bilateral progressive retinal degeneration more common in young people and they have been impressed by the occurrence of retinal detachment in those fundus sectors where the visibility was poorest because of dislocation of the lens in Marfan's syndrome.

Peter C. Kronfeld.

François, Jules. **Contribution to the study of tapeto-retinal degeneration.** Ophthalmologica **118**:1-29, July, 1949.

The author reports a French family six members of which showed a bilateral degenerative disease of the central portion of the retina and choroid. In the early stages of the disease it resembled closely Stargardt's heredomacular degeneration. In the later stages a very marked choroidal sclerosis was added to the picture. The hereditary transmission followed the dominant mode. The author prefers the term tapeto-retinal degeneration for this disease to indicate that, just as in true pigmentary degeneration of the retina, the tapetum or its equivalent is involved in the very early stages of the disease.

To demonstrate the close relationship between true pigmentary degeneration of the retina and hereditary macular degeneration, the author reports another family in which one sister had a typical retinitis pigmentosa and one brother a macular disease of the Stargardt type.

Peter C. Kronfeld.

Hager, Hugo. **Thrombo-angiitis obliterans and the eye.** Klin. Monatsbl. f. Augenh. **114**:238-247, 1949.

A patient with tobacco amblyopia presented a clinical picture of thrombo-angiitis obliterans of the extremities. The fundus showed temporal pallor of the disc, narrow arteries, tortuous veins and slight degeneration of the macula. It is suggested that in tobacco amblyopia the degenerative changes in the nerve and the retina are possibly not caused by toxin, but by thrombo-angiitis obliterans. In a second case of thrombo-angiitis obliterans the patient used tobacco excessively, had small aneurysms and partial obliteration of the vessels in part of the fundus. The vision was only slightly reduced. The author compares these findings with those usual in periphlebitis retinae and concludes that the latter has, contrary to the opinion of Marchesani, nothing to do with thrombo-angiitis obliterans. (4 figures, references.) Max Hirschfelder.

Huber, A. **Cerebral and retinal angiopathy.** Ophthalmologica **117**:265, April-May, 1949.

In hypertensive cardiovascular disease of the benign as well as of the malignant type the parallelism between cerebral and retinal vascular changes is not very close. The likelihood of a cerebral vascular accident cannot be determined from the retinal findings. The parallelism between the renal and retinal vascular changes however is always very close. The author quotes in detail two cases of Buerger's disease with thrombo-angiitic obstructions of large cerebral arteries and pathognomonic eye findings. In both cases ophthalmoscopy suggested arterial occlusion as the main basis of the systemic disease. On the other hand, numerous cases are recorded in the literature in which, in the presence of advanced Buerger's disease, the eye grounds were practically normal. Peter C. Kronfeld.

Klien, B. A. **Histopathologic aspects of retrolental fibroplasia.** Arch. Ophth. **41**: 553-561, May, 1949.

The author believes that retrolental fibroplasia is in some way connected with angioblastic overgrowth of the primary vitreous which may occur at any stage of gestation after formation of the primary vitreous has started. It is the stage in which the retina becomes involved that determines different and characteristic histologic pictures of retrolental fibroplasia. Ralph W. Danielson.

Moginier, A. **The treatment of retinitis pigmentosa with placental tissue and nicotinic acid.** Ophthalmologica **117**:287-290, April-May, 1949.

Thirteen patients with retinitis pig-

mentosa received one or two subconjunctival inoculations of placental tissue and were followed for eight months. In eight the visual acuity and the visual field showed improvement. The dark adaptation remained unimproved. Four other patients were given daily intravenous injections and oral doses of 100 mg. of nicotinic acid for two weeks. The acuity improved in all of them. The visual field was only slightly influenced. Although one can not cure the advanced cases of retinitis pigmentosa, one may hope to keep early patients on a visual level which will permit them to lead a normal life. Peter C. Kronfeld.

Neuenschwander, M. **Our experiences with placenta therapy of retinitis pigmentosa.** Ophthalmologica **117**:290-292, April-May, 1949.

Fifty-seven patients with retinitis pigmentosa received placenta therapy after Filatov, in the form of either subconjunctival injections of placental blood serum or of subconjunctival implantation of placental tissue. The author reports "his six best cases" and draws the following conclusions. "Placenta therapy is not an infallible means of treatment, (but) there are cases (of retinitis pigmentosa) which are definitely improved by placenta therapy. . . . This improvement may last a whole year. . . . Although only a small percentage of cases can be improved, we believe that placenta therapy should be tried in every case of retinitis pigmentosa." Peter C. Kronfeld.

Oxilia, E. **Tissue therapy in retinitis pigmentosa. Late results.** Ann. di ottal. e clin. ocul. **74**:499-511, Sept., 1948.

From personal experience with 30 patients and from a review of the literature Oxilia concludes that if preserved and autoclaved tissue is used in exact accordance with Filatov's method the successes obtained are indisputable. The action does not depend on a colloidoclastic shock. The successes depend on the state of preservation of the vision, but are independent of the age of the patient. Best results are obtained early in the course of the disease, but even late, when destruction is great, some improvement may occur. Most successful are subconjunctival implantations of placenta, especially if accompanied by intramuscular injections of placental extract. Injections of cod liver oil are equally effective but are badly tolerated. Vision, visual fields, and light sense may all show improvement. No changes are observed in the ophthalmoscopic picture, but in some cases Oxilia noted a drop in the retinal arterial pressure. Rapidity and duration of therapeutic effects vary with the method employed and with the state of the visual functions. (References.)

Harry K. Messenger.

Poos, F. **Ascending atrophy of the intraocular vascular system, retinal isobars and progressive concentric contraction of the visual field.** Klin. Monatbl. f. Augenh. **114**:151-161, 1949.

The author attempts to correlate the factors which determine the characteristic concentric progression of certain defects in the visual field. The pressure within the retinal arteries decreases in all radii from the center of the retina toward the periphery and zones can be delimited by isobars. The center of these circles is not the papilla, but the macula. The embryonic development of the retinal vascular system, of which the arching and more strongly developed temporal arteries supply a larger retinal field, make this fact comprehensible. Concentric contraction of the visual field starts when the lowest peripheral pressure does not suffice to provide the proper blood supply in the capillary system, or when the increased or normal intraocular pressure exceeds the normal or decreased vascular pressure.

Hand in hand with the consequent peripheral retinal atrophy goes a progressive shrinkage of the vascular tree. These considerations explain the progressive and irreparable concentric contraction which is marked by isobars between the living and non-living retinal tissue. A special theory is developed for the pathologic physiology in retinitis pigmentosa. (References.) Max Hirschfelder.

Poos, F. **The origin of infarcts after vascular closure in brain and retina.** Klin. Monatsbl. f. Augenh. **114**:247-251, 1949.

There are no true endarteries in the brain and retina and arterial and venous anastomoses do exist. The author explains the origin of the anemic infarct after arterial closure by a compression of the empty capillaries by intracranial or intraocular pressure. The normal balance between intracapillary pressure and the pressure of the surrounding region is disturbed when the capillary pressure sinks to almost zero after arterial infarct. The hemorrhagic infarct after closure of a vein does not lead to a collapse of the capillaries, whose pressure is actually elevated. This explains the lesser degree of functional disturbance after venous closure and the possibility of considerable recovery through collateral circulation. The term "compression infarct" characterizes the anemic infarct, while the term "congestion infarct" describes the hemorrhagic infarct. (References.)

Max Hirschfelder.

Puig Solanes, M. **Anticoagulating treatment of retinal vascular occlusion.** An. Soc. mex. de oftal. **22**:237-262, 1948.

Rather weakly conclusive statistics lead the author to conclude that anticoagulant therapy is the fundamental treatment for obstruction of the retinal veins and is auxiliary but necessary in arterial occlusions. The results are felt to be on the average much better in obstruction of branches of the central vein than in that of the main trunk. (Statistical tables, 14 graphs, references.) W. H. Crisp.

Puig Solanes, M. **Retinal angioscopy in hypertensive patient operated upon by Smithwick's procedure.** (sympathectomy). An. Soc. mex. de oftal. **22**:99-112, 1948.

In the first weeks after the operation one frequently sees narrowing of the retinal arterioles, with increase in the "edematous" papillo retinal lesions. In a few months an angiospasm and the "edematous" lesions may disappear, but with persistence of arterial contraction. The retinal vascular changes in these operated patients are independent of the effects upon arterial tension and the effects produced upon the general condition of the patient. The author supposes that similar modifications may be produced in other circulatory areas of the organism, especially the brain. (References.) W. H. Crisp.

Redslob, E. **Chorioretinal pigmentary degeneration with paradoxical evolution.** Ann. d'ocul. **182**:443-448, June, 1949.

Tapeto-retinal degeneration is briefly described and a case is reported. A 51-year-old woman with defective night vision and a concentrically contracted field since childhood had noticed failing central vision since 1938. Central vision is 8/200 in both eyes. A central scotoma of 20 to 30 degrees is surrounded by a normal zone of 20 to 30 degrees and the periphery is blind. The retina and disc are ophthalmoscopically normal in the central zone. In the intermediate zone, the lesion resembles the constitutional type of pigmentary retinal degeneration with pigment migration into the inner retinal layers. In the periphery there is the salt and pepper fundus usually ascribed to congenital lues. Both congenital syphilis with negative serologic

reactions and a constitutional degenerative process must be considered.

Chas. A. Bahn.

Reese, A. B. **Persistence and hyperplasia of primary vitreous; retrolental fibroplasia—two entities.** Arch. Ophth. **41**:527-552, May, 1949.

Reese presents an excellent discussion of this problem and contrasts the two conditions. Both have in common the persistence of the primary vitreous as the basic congenital lesion, but there is an important difference. In persistence and hyperplasia of the vitreous the primary vitreous remains in toto and, when the secondary vitreous forms, occupies its normal position in a funnel-shaped space behind the lens. There is merely a persistence of the primary vitreous and hyperplasia. In retrolental fibroplasia only a portion of the primary vitreous remains in the region of its base but it is adherent to a portion of the inner layer of the optic cup. As the secondary vitreous forms, it tends to compress and isolate the primary vitreous. This occurs everywhere but in the region where adhesion has taken place, and there the retina becomes detached. In addition, there may be hemorrhage from the persistent vascular primary vitreous, leading to organization, contraction and further retinal detachment. Attempts at relief by surgery have been disappointing, but roentgen treatment of the angiomatous tissue early may be of value.

Ralph W. Danielson.

Reese, A. B., and Blodi, F. C. **Retrolenticular fibroplasia.** An. Soc. mex. de oftal. **22**:208-216, 1948.

This is an excellent summary in Spanish of the history of the subject, emphasizing the importance of the condition as a cause of blindness in children of preschool age. (References.) W. H. Crisp.

Rychener, R. O. **Retinoblastoma in the adult.** Tr. Am. Ophth. Soc. **46**:318-326, 1948.

The clinical and pathologic study of the fifth case of retinoblastoma in an adult is recorded (Illustrations.)

David Harrington.

Schulte, D. **Spontaneous reversal of the arterial flow in the retina.** Klin. Monatsbl. f. Augenh. **114**:251-259, 1949.

After embolism of a large branch of the retinal artery the author observed centripetal flow of blood in some peripheral retinal arteries. The phenomenon is explained by the theory that the capillary net has anastomoses with healthy regions of the retina which raise the capillary pressure sufficiently to overcome the vastly decreased pressure in the arteries of the affected part. (3 figures, references.) Max Hirschfelder.

Shelburne, S. A. **Retinal arteriovenous nicking; a long term study of the development of arteriovenous nicking in hypertensive patients.** Arch. Int. Med. **83**:377-381, April, 1949.

The author presents drawings made from actual patients showing various degrees of retinal arteriovenous nicking, early, moderate, and definite.

A study of 15 cases over a long period proved that early arteriovenous nicking progresses to moderate or definite arteriovenous nicking over a period of years and that the categoric classification previously reported actually represents degrees of the same lesion. These cases show in some measure the time required for progression from first degree of the lesion to the others and the many years required for the formation in hypertensive patients of the fully developed lesion which is called definite arteriovenous nicking.

Theodore M. Shapira.

Vila Ortiz, J. M., Maximo Soto, C., Staffieri, J. J., and Rose, Juan. **Diabetes**

and the ocular fundus. Arch. Soc. oftal. hispano-am. **9**:245-264, March, 1949.

A review of the literature is followed by a tabulated report of the author's own investigations to determine the pathogenesis of the diabetic changes in the fundus. In 50 diabetic patients with ocular complications the arterial presure, renal function, proteinemia, cholesterinemia, calcemia, vascular fragility, and changes in the hemostatic mechanisms were noted and related to the ocular changes, but no correlation could be determined between the degree of these abnormalities and the gravity of the fundus changes. Only one patient had a hypercholesterolemia and the fundus picture was that of retinal sclerosis. In all who had a normal fundus the renal function was normal.

Ray K. Daily.

Vogelius, Henning. **The increasing frequency of diabetic retinopathy.** Acta ophth. **27**:99-111, 1949.

The material which was the basis for this investigation was too small to permit of definite conclusions, and the author uses published data to support his statement that there is an increase in the incidence of retinopathy, which he attributes to inadequate insulin therapy and to the introduction of a free diet for diabetics.

Ray K. Daily.

Weber, E. **Retinal tears without detachment.** Ophthalmologica **117**:263-264, April-May, 1949.

The author restates his findings that retinal holes without detachment can be found in two out of every thousand office patients. A typical case is described in detail. Peter C. Kronfeld.

12

OPTIC NERVE AND CHIASM

Benedict, M. L. **Etiology and treatment of optic neuritis.** Texas St. J. Med. **45**: 126-130, March, 1949.

The subject of optic neuritis is covered completely and comprehensively. A cause which is frequently overlooked is plumbism. The other diseases simulating optic neuritis are mentioned. Over 50 percent of retrobulbar neuritis and a large percentage of optic neuritis is due to multiple sclerosis. Foreign protein therapy, particularly intravenous typhoid vaccine is the treatment of choice in acute cases and vasodilators are used in chronic toxic optic neuritis.

Donald T. Hughson.

Di Luca, G. **Optic nerve atrophy from methyl alcohol poisoning.** Boll. d'ocul. **28**:17-31, Jan., 1949.

Two patients were observed with atrophy of the optic nerves due to methyl alcohol and one to quinine poisoning. The differential diagnosis and pathogenesis are discussed. Ten visual field diagrams and a differential diagnostic table make the data perspicuous. (References.) K. W. Ascher.

François, P. **Hyaline verrucosities of the papilla.** Ann. d'ocul. **182**:249-278, April, 1949.

Hyaline is a polymorphous compound, more dense than colloid but chemically similar, which is deposited in the tissues as the result of local metabolic abnormalities. There are 198 reports of hyaline verrucosity in the papilla in the literature. The lesion may occur as a congenital anomaly; or as a postnatal, slowly-progressive process which may follow mechanical pressure or chemical irritation. Central and peripheral vision may be reduced. One to five or more verrucosities may be located in the papilla or in the optic nerve behind the eyeball. Several forms are mentioned. They occur in the phakomatoses and in Bournaville's disease, in ocular diseases such as retinal pigmentary degeneration, primary and secondary glaucoma, malignant uveal tumors, degenerative uveitis, retinal de-

tachment, and in brain tumors and some vascular diseases. They are essentially a degenerative processs involving primarily neuroglia. One of the six cases reported was secondary to a cerebral abscess which produced a lateral hemianopsia. All of the cases reported had field defects. Campimetric examinations should be made with a 1/1000 target on a Bjerrum Screen. (92 references.) Chas. A. Bahn.

Klauder, J. V. **Penicillin treatment of syphilitic primary optic atrophy.** Am. J. Syph., Gonor. and Ven. Dis. **33**:234-242, May, 1949.

This is an interim report on the treatment of 56 patients with syphilitic primary optic atrophy, begun in April, 1944. The syphilis was acquired in 53 and congenital in three. The results were variable but 32 patients showed no increase in the optic atrophy. No correlation could be made between the spinal fluid response during penicillin treatment and the progress of the optic atrophy. Patients who have had treatment before the penicillin therapy seem to retain the little vision they have. (3 tables.)

H. C. Weinberg.

Tornquist, Ragnar. **Hyaline bodies (Drusen) as the cause of atrophy of the optic disc.** Acta ophth. **27**:1-9,1949.

Three patients developed reduced visual acuity and contraction of the visual fields during a few months. The visual defects were not complete, but numerous islands of perception within the defective field were preserved. In all three cases the discs were slightly pale, and top shaped in form and contained hyaline bodies. (6 visual fields.) Ray K. Daily.

13

NEURO-OPHTHALMOLOGY

Agundis, Teoledo, Jr. **Romberg's facial trophoneurosis.** An. Soc. mex. de oftal. **22**:153-166, 1948.

Two cases of this extremely rare disease, a progressive facial hemiatrophy, first described by Romberg in 1846, are reported. It occurs between the ages of 18 and 30 years, without previous abnormality and is initiated by such sensory disturbances as pain, tenderness and hyperesthesia in areas innervated by one or more branches of the trigeminal nerve. In the affected half of the face gradual atrophy of skin, muscles, and bony framework develops. The orbit and accessory nasal sinuses may be involved. The cause is unknown and no treatment is effective. (6 figures, references.) W. H. Crisp.

Camisacca, Lionello. **The opticokinetic post-nystagmus in cranial traumas.** Riv. oto-neuro-oftal. **23**:284-297, July-Aug., 1948.

In 19 patients who had sustained a trauma of the head, and in 19 normal persons as control, the test for opticokinetic nystagmus was positive in a few cases and in these cases the oscillations were isolated and not well marked. The writer's findings were not in accord with those obtained by Merloo of Holland who found oscillations that lasted up to one half minute. (References.)

Melchiore Lombardo.

Grasso Canizzo, E. **Unusual case of partial third nerve paralysis during a staphylococcic septicemia.** Boll. d'ocul. **28**:110-116, Feb., 1949.

This rare condition was due to staphylococcus albus infection and was cured in a few weeks by administration of penicillin and of sulfathiazol. (References.)

K. W. Ascher.

Lauber, H. **Scintillating scotoma.** Klin. Monatsbl. f. Augenh. **114**:168-171, 1949.

Lauber describes scintillating scotomas which he himself experienced during the past six years, at first only twice annually, but lately every 6 to 10 weeks. One attack

was followed by a loss of consciousness and another attack was combined with alexia. The author ascribes the phenomena to ophthalmic migraine caused by vascular spasms in the field of the vertebral and basilar arteries. (References.)

Max Hirschfelder.

Rubino, A., and Esente, I. **The eye and the diencephalon. (VII) The glycemic curve from addition of glucose and "photoglycemic" reflex in patients affected by pigmentary degeneration of the retina.** Riv. oto-neuro-oftal. **23**:244-249, July-Aug., 1948.

In eight patients a glycemic curve was obtained which could be referred to the diencephalic glyco-regulator centers. The photoglycemic reflex was normal.

Melchiore Lombardo.

Tornquist, Ragnar. **An anomaly of the retinal vessels (so called aneurysma cirsoides) sometimes combined with symptoms from the central nervous system.** Acta ophth. **27**:11-17, 1949.

Tornquist reports a case of a racemose aneurysm, in the left fundus of a 31-year-old woman, who had persistent headache and a slight right-sided hemiparesis which were tentatively ascribed to meningitis. The left eyeground presented a picture of typical racemose aneurysm, with a number of aneurysmal dilatations of the arteries near the disc, and there were a few retinal pigment spots. There were no visual disturbances and other examinations were essentially negative. The literature is reviewed. (1 figure.)

Ray K. Daily.

Wilson, W. C. **Inequality of the pupils in head injury; a clinicopathologic study.** Arch. Neurol. and Psychiat. **61**:385-401, April, 1949.

In a series of 451 cases of anisocoria there were 192 clinical cases and 259 clinicopathologic. The number of cases of anisocoria with normally reacting pupils was inversely proportional to the severity of the lesions. In the majority of the cases the condition was associated with hematomas from 0.3 to 1.5 cm. in thickness. The hematoma was homolateral with the dilated pupil in the majority of the cases. By observations of the functional state of the unequal pupils it is possible to estimate the severity, thickness and laterality of the lesion.

In 166 cases (36 percent of the total number) there was an altered reaction to light with impingement on the oculomotor nerve. In the remaining 285 cases (64 percent) there was a brisk, reaction to light and no dysfunction of the extraocular muscles; autopsy, when performed, showed no evidence of impingement on the oculomotor nerve. The majority of the cresyl violet preparations of the premotor cortex showed no change, or only increased perineural and perivascular spaces with pale-staining cellular elements, therefore correlation was not great between the clinical evidence indicating interrupted physiologic continuity and the degree of demonstrable pathologic change.

Theodore M. Shapira.

14

EYEBALL, ORBIT, SINUSES

Chavira, R. A. **Clinical notes concerning fractures of the orbit.** An. Soc. mex. de oftal. **22**:175-190, 1948.

Fourteen clinical cases are summarized with details of ophthalmologic and neurologic symptoms. (Reference.)

W. H. Crisp.

Giggleberger, H. **Cholesteatoma of the orbit.** Klin. Monatsbl. f. Augenh. **114**:206-211, 1949.

Two cases of exophthalmus are described. X ray revealed hyperostosis of the bony wall of the orbit as well as rarefaction of bone. The cause was cho-

lesteatoma, one confined to the orbit, the other one broken through into the cranial cavity. Dermoids may give the same clinical appearance. Early surgical removal is advised to avoid a breakthrough of the tumor into the frontal sinus and the cranial cavity. (3 X-ray figures, references.) Max Hirschfelder.

Goodyear, H. M. **Ophthalmic conditions referable to diseases of the paranasal sinuses.** Arch. Otolaryng. **48**:202-208, Aug., 1948.

Goodyear presents his observations in cases of retrobulbar neuritis in patients with normal ethmoid and sphenoid sinuses. In these cases vision frequently returns to normal after the opening of the sphenoid sinus and posterior ethmoid cells on the side of the optic lesion.

In the past 15 years, he has observed that the injection of 27-percent iodized oil into the sphenoid will produce the same spectacular result as is obtained by surgical intervention. In acute swelling and edema about the eye after an acute infection of the frontal sinus, chemotherapy and external drainage is advised. Recurring corneal ulcers demand a careful survey of the paranasal antrums. Acute suppurative ethmoiditis in an infant is frequently mistaken for dacryocystitis. Patients with tumors in the paranasal sinuses often go to the ophthalmologist first because of disturbed vision and pain of the eye and frequent double vision.

Theodore M. Shapira.

Pfeiffer, R. L., and Nicholl, R. J. **Dermoids and epidermoids of the orbit.** Tr. Am. Ophth. Soc. **46**:218-243, 1948.

Case histories, physical findings, photographs, X-ray pictures and treatment of nine cases of dermoid of the orbit are presented. The incidence of dermoids and epidermoids is discussed and the similarity between the growths is stressed. Elimination of the term epidermoid is advocated. The roentgenographic characteristic of these lesions is an area of diminished density with smooth regular margins of increased density. Proper roentgenography is essential for diagnosis. The plan of treatment rests upon the defect revealed. David Harrington.

Semadeni, B. **Tuberculous panophthalmitis.** Ophthalmologica **117**:273, April-May, 1949.

A young man, released from a German concentration camp was admitted to a sanitarium at Davos with localized infiltrates in the right lung and at the hilus. Diffuse peritonitis and tuberculous meningitis were suspected. A few weeks after admission the patient developed an acute iridocyclitis in his left eye. Within a few days the iris became studded with yellow nodules. The disease took the course of tuberculous panophthalmitis. The patient died of tuberculous meningitis about three weeks after the onset of the iridocyclitis. The pathologic findings were typical.

Peter C. Kronfeld.

Wüst, K. **Treatment of imminent optic nerve atrophy due to retrobulbar hematoma and surgical access to the retrobulbar space.** Klin. Monatsbl. f. Augenh. **114**:140-144, 1949.

The author describes a case of retrobulbar hematoma with bilateral amaurosis after traumatic compression of the thorax. The retrobulbar space was entered through the maxillary sinus with removal of the floor of the orbit. This approach is ideally suited for such hematomas which may occur in disease (scurvy, hemophilia, venous stasis) or may be due to trauma. The author's patient recovered completely. Proptosis and amaurosis disappeared at once. (References.)

Max Hirschfelder.

15

EYELIDS, LACRIMAL APPARATUS

Berke, R. N. **An operation for ptosis utilizing the superior rectus muscle.** Tr. Am. Acad. Ophth. pp. 499-518, May-June, 1949.

The author has modified the Motais operation. Through a conjunctival incision the superior rectus tendon is divided into three longitudinal tongues on each of which a suture is placed. The ends are inserted into the lid margin and tied. A buried chromic catgut suture is passed through the stump of the superior rectus tendon and through the superior rectus in its new position. A third set of four sutures is placed through the superior rectus in its altered position and then through the skin. A weakened superior rectus may be used, a smooth curve of the upper lid is obtained, entropion is prevented, and the operation may be used on very young children but normal winking is interfered with, and lagophthalmus is present during sleep. The author performed his operation on 20 patients without failure and recommends it only where resection of the levator is contraindicated. (18 figures.) Chas. A. Bahn.

Berke, R. N. **Congenital ptosis: a classification of two hundred cases.** Arch. Ophth. **41**:188-197, Feb., 1949.

A statistical study has been made of 200 consecutive cases of congenital ptosis seen at the Institute of Ophthalmology during the past fifteen years. There was a normal superior rectus muscle in 147, weakness of the homolateral superior rectus alone or combined with weakness of the homolateral inferior oblique in 34, the jaw-winking phenomenon of Marcus Gunn in 12, and ptosis associated with plepharophimosis in 7. The ptosis was unilateral in 145 and bilateral in 55, simple in 147 and complicated by horizontal or vertical anomalies in 52. In 107 the levator muscle was active enough to justify resection of the muscle. In the others there was no such function and some modification of the Motais-Parinaud operation or the frontalis type of procedure was indicated. John C. Long.

Castresana y Guinea, Angel. **Palpebral filaria.** Arch. Soc. oftal. hispano-am. **9**:293-305, March, 1949.

The literature is extensively reviewed and a case is reported. The presence of a filaria in the lower lid of a woman who became infected with the parasite in Guinea was recognized by its movements. It was pinched in a fold of skin with a forceps and surrounded with injected novocain. It became immobile and was then removed through an incision.

Ray K. Daily.

16

TUMORS

Forrest, A. W. **Intraorbital tumors.** Arch. Ophth. **41**:198-232, Feb., 1949.

In a series of 222 cases of intraorbital tumor from the Registry of Ophthalmic Pathology which were studied histologically and clinically, 184 tumors were primary in the orbit; 93 were of mesenchymal origin, 48 related to the nervous system, 25 mixed tumors of the lacrimal gland and 18 were dermoids. Forty-four, or 24 percent, of the primary tumors were malignant. The 38 secondary tumors were 24 carcinomas, 6 neuroblastomas, 6 malignant melanomas, 1 retinoblastoma and 1 adenoma. Lipomas and dermoids were often anteriorly situated, and sarcomas, meningiomas, neurofibromas and gliomas were more frequently posterior and caused exophthalmos. Mixed tumors and hemangiomas were about equally divided between the two locations. Malignant mesodermal tumors, gliomas of the optic

nerve, hemangiomas and metastatic neuroblastomas occurred predominantly in youth and the tumors of the hematopoietic system and secondary carcinomas in more advanced age. John C. Long.

Kambara, G. K. **Choroidal metastasis of a testicular chorionic epithelioma.** Arch. Ophth. **41**: 587-598, May, 1949.

A case of a testicular chorionic epithelioma with metastases to the choroid of the right eye and in the brain, breast, stomach, intestine, liver, adrenal gland, subcutis, heart, lungs and pancreas is presented. Only three others in men and three cases of metastases to the choroid in women from chorionic epithelioma of the uterus have been reported.

Ralph W. Danielson.

O'Day, K. **Leiomyoma of the iris.** Brit. J. Ophth. **33**:283-290, May, 1949.

Tumors of the iris are rare and all too often the oculist approaches the problem with a mind biased toward malignancy so that eyes are too often removed needlessly. A case of a benign leiomyoma of the iris is reported. These tumors can often be removed completely by an iridectomy and diagnostic biopsy is urged. Clinically these tumors appear as gray, vascular, sessile or pedunculated tumors, with little, if any pigment. They may be slow growing with periods of activity and may give rise to hyphema or even to cataract accomplicata and probably originate in an embryonal defect. (8 figures.)

Morris Kaplan.

Oravisto, Terttu. **Neurofibromatosis in the region of the eye.** Acta ophth. **27**:89-98, 1949.

The literature is reviewed, and two cases reported in detail, including histologic data. The patients were four-year-old girls. One had a mass in the upper lid, and the other in the lower lid with thickening of the adjacent tissues. One patient had congenital hydrophthalmos in one eye, and optic atrophy in the other. The other had no other ocular abnormalities. (2 figures.)

Ray K. Daily.

Pasca, G. **Two cases of chloroma orbitae; its hematocytoblastic origin and its treatment with ethylurethan and penicillin.** Boll. d'ocul. **28**:101-109, Feb., 1949.

In two cases of chloroma of the orbit in children, aged, 4 and 5 years, hemocytoblasts were found in the circulating blood as well as in the tumors. This seems to confirm the new hypothesis that chloroma is a form of hemocytoblastosis. In the girl, the disease involved both eyes while it was unilateral in the boy. The therapy mentioned in the title did not bring any improvement. (References.)

K. W. Ascher.

Silva, Daniel. **Errors of diagnosis in infantile intraocular tumors.** An. Soc. mex. de oftal. **22**:217-236, 1948.

The author reports three cases. The chief cause of error is the appearance of a supposed tumor mass ("cat eye") diagnosed as glioma. In the author's first case the existence of marked photophobia was erroneously interpreted in spite of Terry's insistence upon the characteristic photophobic facies of children with retrolenticular fibroplasia, who automatically raise their hands to cover their eyes in the presence of light. In the second case too much importance was attached to hemorrhages, in spite of Reese's advice as to the frequent relation between fibroplasia and angiomatous processes. Excessive weight may be attached to the absence of prematurity at birth. The third case, in which the eye was not enucleated for glioma until invasion of the optic nerve was far advanced, emphasizes the necessity for using every possible means of diagnosis, including transillumination

under general anesthesia if necessary, and even enucleation and microscopic study of one eye. (9 figures, references.)

W. H. Crisp.

Soria. **Radium therapy in malignant epibulbar tumors.** Arch. Soc. oftal. hispano-am. **9**:405-414, April, 1949.

On the basis of his experience with 17 patients, treated since 1929, Soria urges the application of radium-therapy for epibulbar malignant tumors which have not extended into the eyeball. He describes a method of application which consists in fixing with conjunctival sutures a tube 22 mm. in length and 2 mm. in diameter over the site of the tumor; over the tube is placed a lead shield 1 mm. in thickness, also fixed to the conjunctiva with sutures, through small perforations on its edges. The tube contains 5 mgm. of radium, and is left in place for 72 hours, with the patient in bed, and both eyes bandaged. The results were good in all but one patient. The side reactions of the irradiation were mild conjunctivitis, which healed in a few weeks, vascularization of the adjacent conjunctiva, which was obliterated by the application of a diathermy electrode, edema of the lids which disappeared spontaneously, and, in the eyes which were treated without the lead shield, a localized madarosis, the occurrence of which was eliminated by the shielding with lead. (2 figures, 4 photomicrographs.) Ray K. Daily.

Souders, B. F. **Juxtapapillary hemangioendothelioma of the retina; report of a case.** Arch. Ophth. **41**:178-182, Feb., 1949.

A case of von Hippel's angiomatosis retinae in a man, aged 40 years, is reported. The tumor, immediately adjacent to the optic nerve head, gave the preoperative impression of a malignant tumor of the optic nerve and the eye was enucleated. A detailed pathologic report and photomicrographs are included.

John C. Long.

17

INJURIES

Chavira, R. A. **Traumatic syndrome of the eye.** An. Soc. mex. de oftal. **22**:113-130, 1948.

This is an 18-page thorough enumeration of various visual and other ocular effects arising from contusion of the eyeball. (References.) W. H. Crisp.

Granstrom, K. O. **Extraction of non-magnetic intraocular foreign bodies.** Acta ophth. **27**:47-58, 1949.

Fifteen extractions of non-magnetic foreign bodies are briefly described. In three the foreign body was situated in the anterior chamber, and the extraction was not difficult. Extraction of foreign bodies in the angle of the anterior chamber is greatly facilitated by X-ray control on the operating table and a T incision at the limbus. The precise location of the 12 foreign bodies in the vitreous or ocular wall was determined with a portable X-ray apparatus, and repeated X-ray photographs by the Larsson method, in which a point of a needle is imbedded in the exposed sclera over the previously determined site of the foreign body. The needle is moved and the roentgenogram repeated until the needle is shown exactly over the foreign body. A scleral flap, instead of radial incision, gives better access to the foreign body. In 3 of the 12 the author was successful.

Ray K. Daily.

Hill, J. C. **Visual manifestations of head injuries.** Canad. M.A.J. **60**:464-468, May, 1949.

Most ocular abnormalities following head injuries are, 1. injury to the globe, 2. derangement of ocular motility, and 3.

lesions of visual pathways. This paper deals with lesions of visual pathways that occurred in World War II veterans seen at Christie Street Hospital Eye Clinic. Fifty-two cases of head injuries with ocular involvement were studied. In 25 cases disturbance of the optic nerve resulted in varying degrees of loss of visual acuity and optic atrophy. Fracture of the optic foramen was found in only four cases and only two lesions affecting the optic tracts were observed. In 25 cases the injury affected the optic radiation and visual cortex. There was marked loss of field with slight loss of visual acuity.

Theodore M. Shapira.

Stein, A. **The treatment of burns.** Ophthalmologica 117:232-237, April-May, 1949.

In the later stages of conjunctival and corneal burns, the author considers ischemic processes to be the predominant injurious factor. In order to alleviate this ischemia, he recommends the use of priscol in the form of constant eye baths. Twenty to 40 drops of the 10-percent priscol solution are added to 8 to 9 cc. of either artificial tears or blood plasma. This mixture is kept in contact with the cornea and conjunctiva by means of the rubber eye cup described in previous communications. A new feature has been added to this eye cup in the form of a heating device which keeps the solution at body temperature. The author reports good results in 10 cases of acid, lime and lye burns of the anterior surface of the eye.

Peter C. Kronfeld.

Weber, E. **Simple procedure for the extraction of intracorneal wood splinters.** Ophthalmologica 117:238-239, April-May, 1949.

A splinter of wood penetrated the cornea more or less perpendicularly and no graspable portion protruded externally. For the extraction of such foreign bodies Weber recommends the following procedure. By careful dissection with a small Graefe knife, a small portion of the external end of the splinter is exposed. The tip of this Graefe knife is now introduced into the exposed portion, thereby securing the foreign body. With the aid of another Graefe knife introduced from the other side, the foreign body is extracted.

Peter C. Kronfeld.

Witmer, R. **The extraction of nonmagnetic intraocular foreign bodies.** Ophthalmologica 117:277, April-May, 1949.

The exact roentgenographic method of localization of intraocular foreign bodies by Goldmann and Bangerter (Ophthalmologica 101:139 and 215, 1941) has proved to be very helpful. The method is most suitable for foreign bodies which are situated close to the wall of the eyeball. After gross localization by means of lateral and antero-posterior X-ray examination, the scleral area closest to the foreign body is exposed surgically. A metal ring, 3 mm. in diameter, is attached to the sclera by means of fine barbs. A piece of dental film is placed right next to the ring and another X-ray picture is taken. The position of the ring is changed until the foreign body seems to be located in the center of the ring. Then the sclera is opened, and the choroid and retina carefully incised. The foreign body then either presents itself or can be found by feeling around "in the dark" with a small forceps. The remarkable thing about the report is that with this method of localization the final results of extractions on nonmagnetic foreign bodies are almost as good as those of magnetic foreign bodies.

Peter C. Kronfeld.

18

SYSTEMIC DISEASE AND PARASITES

Alpers, B. J., Foster, F. M., and Herbut, P. A. **Retinal, cerebral and systemic**

arteriosclerosis: a histopathologic study. Arch. Neurol. and Psychiat. **60**:440-456, Nov., 1948.

The authors studied the retinal and cerebral vessels of 100 adults on whom autopsy was performed. Their findings are not in agreement with the general clinical impression that retinal arteriosclerosis is a sign of cerebral arteriosclerosis. Retinal arteriosclerosis merely indicates a 6 to 1 probability of cerebral arteriosclerosis, and absence of retinal arteriosclerosis does not exclude the presence of cerebral arteriorsclerosis.

R. Grunfeld.

Brand, I. **The ocular tension in myotonic dystrophy.** Orvosi Hetilap **12**:376-380, 1949.

In a patient with myotonic dystrophy the tension of both eyes was strikingly low, especially on the side opposite the more atrophic testicle. The injection of antephysan resulted in a paradoxical response, namely increase of ocular tension. Hypotony is probably a frequent symptom in myotony. Gyula Lugossy.

Busacca, Archimede. **The green iridescent color of the intravitreal cysticercus.** Ophthalmologica **117**:347-348, June, 1949.

Examination with the binocular ophthalmoscope of a typical intravitreal cysticercus revealed the iridescence of the cyst to be due to the presence of crystals in its walls. Peter C. Kronfeld.

Cass, E. E. **A case of ocular myiasis.** Brit. J. Ophth. **33**:385-386, June, 1949.

Flies may lay their eggs in the conjunctival sac and some are dangerous as their maggots may burrow beneath the conjunctiva and even penetrate the globe. The case of a man who thought dust blew into his eye is presented. Severe pain with edema developed and eleven maggots were subsequently removed. The man insisted that the maggots must have been in the cement mixture or the tap-water which was near and claims compensation.

Orwyn H. Ellis.

Dinger, G. **Observations in the fundus oculi in cases of pulmonary tuberculosis.** Klin. Monatsbl. f. Augenh. **114**:105-107, 1949.

Almost 14 percent of 284 patients with pulmonary tuberculosis had fundus lesions. Nearly all patients had good central vision. The lesions were, for the most part, peripheral healed chorioretinitic scars. There were no patients with fresh lesions. (References.)

Max Hirschfelder.

Djacos, C. **The ocular symptoms of pellagra.** Ann. d'ocul. **182**:279-294, April, 1949.

The author reports 41 cases of ocular lesion in an epidemic of pellagra. This disease results from a deficiency primarily of nicotinic acid, but also of other components of the B2 group. The most frequent ocular lesion was bilateral conjunctival edema with slight hyperemia. Corneal lesions were epithelial or interstitial. The former were characterized by a large number of fine, punctate epithelial opacities and depressions. The interstitial form usually involved the lower part of the cornea, and consisted of several deep nodules which had a tendency to ulcerate. Transient, faint, tongue-shaped opacities were observed in the lens. Night blindness was not an important symptom, nor were there retinal hemorrhages, papilledema, or neuritis. These lesions have been mentioned in the literature.

Chas. A. Bahn.

Doggart, J. H. **Diseases of the eye in relation to dental surgery.** Brit. J. Ophth. **33**:338-347, June, 1949.

Developmental defects, trauma, and skeletal and endocrine diseases are

briefly reviewed because they offer many striking instances of associated dental and ocular disturbance. Eyes and teeth share susceptibility to a number of toxic hazards. The widespread theory of focal sepsis with teeth as the chief cause of ocular infection is vigorously attacked and ruthless dental extractions decried. Closer cooperation between the oculist and dental surgeons is urged.

Orwyn H. Ellis.

Fontana, Giuseppe. **Ophthalmoscopic examination of children with tuberculous meningitis and miliary tuberculosis, treated by streptomycin.** Arch. di ottal. **52**:182-188, July-Aug., 1948.

Twenty patients, ranging in age from 9 months to 17 years, were observed ophthalmoscopically, some during treatment, with streptomycin, and others with streptomycin combined with a sulphonamide and vitamins A and D. Twelve had tuberculosis meningitis and eight had miliary tuberculosis in addition to the meningitis. In four there were no abnormal eye findings, in nine there was papilledema and in seven there was vascular stasis in the nerve head. In two of the last group miliary tubercles of choroid and iris tubercles were also present. In the nine with edema, marked regression of the edema was noted in 20 days, and two had normal papillae in 90 days. Those with vascular stasis in the papilla showed a greater resistance to treatment and persisted longer than others. This showed a direct relationship to the severity of the meningeal process. Miliary tubercles of the choroid indicated a general miliary tuberculosis. The manifestations of the nerve head and the choroid offered considerable information of value in the diagnosis and prognosis of these forms of tuberculosis.

Francis M. Crage.

Godtfredsen, E. **Pathogenesis of concurrent eye and joint diseases.** Brit. J. Ophth. **33**:261-270, May, 1949.

An increasing awareness of an association between certain joint diseases both acute and chronic and eye symptoms along with increasing interest in allergies brings this report of study in Denmark. The list of acute joint diseases includes rheumatic fever, gonorrheal arthritis, simple urethritic polyarthritis (Reiter's disease) and uratic arthritis while the chronic diseases are Still's disease and ankylopoietic spondyloarthritis. In the first group eye symptoms were found in 2 to 80 percent, and in the second in 2 to 50 percent. These are in the main three groups of eye diseases namely: endogenous conjunctivitis, scleritis and episcleritis; iritis and iridocyclitis, and the sicca syndrome.

It is felt that most of the joint symptoms are an allergo-toxic reaction to a coccus, usually hemolytic streptococcus, or to a virus. It is supposed that the eye symptoms are a similar allergo-toxic phenomenon. This is borne out to some extent by histologic study. Concurrent disease in the heart, the skin and cavities lined with mucous membrane may also be significant.

Morris Kaplan.

González Aguilar, E. **The thesaurismoses.** An. Soc. mex. de oftal. **22**:192-199, 1948.

These diseases are characterized by abnormal deposits of various substances in tissue cells such as Gierke's, Schuller-Christian's, Gaucher's, and Niemann-Pick's. (References.)

W. H. Crisp.

Magitot, A. **Congenital syphilis.** Ann. d'ocul. **182**:306-312, April, 1949.

The changes of treatment and examination in syphilis during the past generation are reviewed. Retinal pigmentary degeneration and Leber's Disease are now known to have no relationship to congenital syphilis. Infection usually does not take place before the fifth month of intrauterine life because the embryo is not nourished directly by the mother's blood

until that time. Fewer fetal malformations are directly due to congenital syphilis than was thought. If the infection is virulent, the child is usually born dead and in approximately 30 percent, prematurely. Luetic infections tend to become less virulent with time. The positive Bordet-Wassermann test shows that maternal antibodies have been transmitted to the embryo, and disappears with the antibodies. Infection of the second generation is possible, but very rare. The symptoms may begin at birth or later. Iritis, choroiditis and cutaneomucous gummas are later manifestations. Dental changes, rickets, a tendency toward some infectious disease and endocrine anomalies are among the frequent evidences of congenital lues in youth. Medication should be continued until the patient is serologically negative. Trivalent arsenic and oil and soluble bismuth preparations are preferred to mercury in the treatment of the ocular symptoms of congenital syphilis. The use of penicillin is experimental.

Chas. A. Bahn.

Rosen, Emanuel. **The significance of ocular complications following vaccination.** Brit. J. Ophth. **33**:358-368, June, 1949.

The literature on ocular complications following vaccination and also on postvaccinial encephalitis is reviewed and six case reports are presented. Ocular complications developing within a specific period after vaccination are part of a postvaccinial ocular syndrome which may consist of interstitial keratitis, central serous retinopathy and cranial nerve involvement. Cases illustrating activation of previously existing conditions are presented. The pathologic picture of postvaccinial encephalitis and the encephalitis of the acute exanthemata are identical. The author points out many characteristics of this condition which may ultimately be explained on an allergic basis.

Orwyn H. Ellis.

Smith, Mary D. **Diabetic neuropathy with Argyll Robertson pupils: report of two cases.** Glasgow Med. J. **30**:181-184, May, 1949.

The neurologic complications of diabetes mellitus are reviewed. In one series of 3,000 diabetics two had this complication and in another series of 19,000 only 10 had Argyll Robertson pupils. The first patient with severe diabetes had small irregular pupils that did not react to light but did react in accommodation. The iris was atrophic and there were lens opacities and retinal exudates and hemorrhages. The deep tendon reflexes were absent in the legs and diminished in the arms. Under treatment for diabetes the superficial and deep reflexes in the legs returned to normal. The pupillary reflexes did not change. The other patient displayed similar manifestations. The causes for the appearance of neurological changes in diabetes are reviewed.

H. C. Weinberg.

Wilson, W. A. **Temporal arteritis with report of a case.** Ann. West. Med. and Surg. **3**:177-179, May, 1949.

Arteritis complicated an otherwise normal cataract extraction and recurring hemorrhages and secondary glaucoma followed. An inflammation of the adventitia of the vessel spreads to the media where focal necrosis and giant cell reaction occur. The intima becomes thickened but is not otherwise affected.

Orwyn H. Ellis.

19

CONGENITAL DEFORMITIES, HEREDITY

Briggs, A. H., and McLean, D. W. **An unusual congenital defect.** Brit. J. Ophth. **33**:381-384, June, 1949.

A mass present in the anterior chamber and adherent to the posterior corneal surface in one quadrant and apparently of mesodermal origin, was seen at birth. Vessels were present on its anterior sur-

face. There was an anomalous distribution of the vessels of the optic disc. The condition was unchanged at six years of age and no useful vision was found.

Orwyn H. Ellis.

Cuendet, J. F., and Della Porta, V. **Hereditary nystagmus.** Ophthalmogica **117**:199-201, April-May, 1949.

The report deals with a family of 106 members, 22 of whom were affected with typical congenital (hereditary) nystagmus. The mode of transmission was dominant and sex-linked.

Peter C. Kronfeld.

Franceschetti, A., and Maeder, G. **Cataract associated with skin lesions of the poikiloderma and scleroderma type.** Ophthalmologica **117**:196-198, April-May, 1949.

On the basis of a review of the literature, the authors give a detailed description of the two hereditary diseases indicated in the title. The association of cataract with skin lesions of the type of poikiloderma atrophicans vasculare is known as Rothmund's disease. The skin lesions develop during the first year of life, often in the form of one eruption, and are characterized by patchy hyper- and hypopigmentation, telangiectasis and atrophy, preceded in places by true vesicles. Nails and hair are also affected. The skin lesions reach a standstill in early childhood. Cataracts of the endocrine type make their appearance between the ages of two to six years. Hypoplasia of the ovaries or testes is the characteristic endocrine manifestation of this disease. The affected individuals are of normal height and mentality. The disease is hereditary, the mode of transmission probably recessive. Franceschetti and Maeder have found 20 cases of this disease in the literature.

Scleroderma associated with cataracts is known as Werner's syndrome. Here again the basic anomaly appears to be genital hypoplasia, of a higher degree, however, than in Rothmund's disease. The skin lesions are progressive and recurrent. The disease is also hereditary, and more common in men than in women. The authors have found 42 cases of this disease in the literature.

Peter C. Kronfeld.

François, J. **Familial dermochondrocorneal dystrophy.** Ann. d'ocul. **182**:409-442, June, 1949.

The author reports the first two cases of this rare dystrophic syndrome in siblings. In an otherwise normal boy, aged 11 years, and his 12-year-old sister, the several constitutional degenerative processes became manifest after birth. They had numerous bilateral, symmetrical, subepithelial corneal opacities of different sizes and shapes, deformities of the epiphyses of the metacarpal and tarsal bones, and numerous xanthomas on the fingers, nose, and ears. The differentiation from several types of corneal, osteochondral and lipid genetic abnormalities is briefly discussed. The disease in these siblings resembled dysostosis multiplex.

Chas. A. Bahn.

Heatley, Juan. **Congenital familial miosis.** An. Soc. mex. de oftal. **22**:141-148, 1948.

A family tree of 5 generations and 30 individuals is presented. Nine were investigated, trustworthy data were obtained on 10, and the condition of 11 was unknown. Seven subjects had congenital miosis which was associated with microcornea in three, 11 had myopia, and three had increased tension. The defect was not pure hereditary and congenital miosis, but a series of four changes which seemed irregularly mixed, transmitted dominantly, and, except the tension, present from childhood. (References.)

W. H. Crisp.

Paraipan, C. **Bilateral anophthalmos.** Ann. d'ocul. **182**:214-215, March, 1949.

The author examined an otherwise normal new-born girl with no traceable hereditary tendency to ocular defects who had microblephary and almost complete absence of both eyeballs. This rarity is ascribed to maldevelopment of the optic vesicle. Chas. A. Bahn.

Straub, Wolfgang. **Congenital anterior synechia of the pars retinae of the iris.** Klin. Monatsbl. f. Augenh. **114**:211-213, 1949.

A patient exhibited a brown tubular strand of tissue which originated behind the iris, penetrated the anterior chamber and was inserted in a gray area in the endothelium of the cornea. It is believed that this was caused by a damage of the corneal endothelium during early intrauterine life resulting in an adhesion between the pars retinae of the iris and the endothelium corneae at a time when the cavity of the optic vesicle was still open. (1 figure, references.)

Max Hirschfelder.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Aug, J. C. **An early photograph of von Helmholtz with explanatory letter.** Arch. Ophth. **41**:570-571, May, 1949.

An interesting letter written by Prof. Ernst von Brücke a few months before his death accompanies the photograph.

Ralph W. Danielson.

Fanta, H. **Causes of blindness in the young.** Klin. Monatsbl. f. Augenh. **114**: 219-224,1949.

Among the 90 pupils of the Vienna School for the Blind there were 15 with partial and 75 with total blindness. Nearly one half of the partially blind had congenital cataract and most of them had been operated on. Of the total blindness 20 percent resulted from injury, 14 from retinal degeneration, 9 from cataract, 9 from atrophy of the optic nerve, 7 from brain tumor and 5 from glaucoma. The blindness due to ophthalmia neonatorum was only 3 percent. Max Hirschfelder.

Hruby, K. **Urgent conditions in the eye.** Wien. klin. Wchnschr. **61**:337-341, June 3, 1949.

This lecture was given to a group of general practitioners to point up the conditions in the eye which threaten vision. Symptoms seemingly unimportant to the patient, such as contraction of the field and slowly progressive loss of vision, beginning lid epithelioma, and lagophthalmos must be recognized as serious by the physician who first sees them. Vaccination blepharitis, diphtheria and gonorrhea are extremely serious. The practitioner should learn to differentiate ciliary from conjunctival injection and recognize the significance of each. Hruby describes the first-aid measures the general practitioner should employ in acute iritis and in chemical and perforating injuries. He discusses in detail the early recognition of glaucoma and the importance of not mistaking it for senile cataract. He points out how important early operation is in retinal detachment. Finally, amblyopia ex anopsia may lead to loss of vision and glasses should therefore be prescribed early after congenital cataract operation and in strabismus. Myopia and hyperopia in the child need correction only if they are very severe. B. T. Haessler.

Kuhn, H. S. **A manual on toxic hazards.** Tr. Am. Acad. Ophth. pp. 595-596, May-June, 1949.

This manual, which has recently been published, is the result of two years' effort by the Joint Committee on Industrial Ophthalmology, and was made possible by the National Society for the Preven-

tion of Blindness. The first section deals with tests, protective means and similar data pertaining to industrial ophthalmology. In the second section, a preliminary report of ocular toxic chemicals is presented in detail. The scientific and trade names are given as well as the symptoms and chemical effects. In the third section a description of the accepted emergency first aid procedures in treatment of chemical eye injuries is reported in detail. This manual should be in the office of every ophthalmologist. Chas. A. Bahn.

del Mazo y Ascona, J. G. **The protection of the blind in Spain.** Arch. Soc. oftal. hispano-am. **9**:353-358, April, 1949.

The social and welfare organization for the blind in Spain is described.

Ray K. Daily.

Podesta, H. **Goethe and Kirschmann's "reversed spectrum."** Arch. f. Ophth. **148**: 787-794, 1948.

The paper presents some of Goethe's studies of the reversed spectrum in which the complementary colors appear in the place of the usual ones.

Ernst Schmerl.

Sullivan, R. R. **The navy eye-correction, eye-protection program.** Tr. Am. Acad. Ophth. pp. 615-620, May-June, 1949.

The fundamentals of eye-correction and eye-protection are briefly presented and a number of suggestions offered.

Chas. A. Bahn.

Trueman, R. H. **A survey of state fee schedules for industrial eye care.** Tr. Am. Acad. Ophth. pp. 605-614, May-June, 1949.

The author graphically compares and contrasts the ophthalmic surgical fees allowed by different states for patients under their care. Chas A. Bahn.

Uribe Troncoso, Manuel. **The fiftieth anniversary of Anales de Oftalmologia.** An. Soc. mex. de oftal. **22**:205-207, 1948.

Uribe Troncoso, in association with Daniel M. Vélez, established the Anales in July, 1898, to promote the development of ophthalmology in Mexico. It was the only periodical publication in the Castilian language devoted to ophthalmology. The printing was at first undertaken by a department of the Mexican government and other expenses were borne by the founders. Then it was the official organ of the Mexican Ophthalmological Society and still is. Five or six years later Menacho of Barcelona, Spain, and Santos Fernández of Cuba started in the Spanish (Castilian) language the Archivos de Oftalmologia Hispano-Americanos and proposed combining the two journals under an editorial office in Barcelona. This invitation was rejected. After fourteen years the Mexican revolution of 1910 caused suspension of the Anales, and in 1916 Uribe Troncoso left Mexico and settled in New York. After the years of social depression the Anales was continued in Mexico by Daniel Vélez.

W. H. Crisp.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received by the editor at least three months before the date of occurrence.

Deaths

Dr. Ira Bradford Chadwick, Coffeyville, Kansas, died June 16, 1949, aged 79 years.

Dr. John M. Robinson, Goshen, New York, died June 24, 1949, aged 79 years.

Dr. Milton J. Stern, Lexington, Kentucky, died June 12, 1949, aged 59 years.

Announcements

AOS Transactions

The 1949 Transactions of the American Ophthalmological Society, published in book form, may be purchased by advance subscription. Containing the scientific papers given at the annual meeting and the theses for membership, this volume may be ordered from the editor:

Dr. Wilfred E. Fry
1930 Chestnut Street
Philadelphia 3, Pennsylvania

The price is $12.00, and all orders must be received by December 1, 1949.

Gill graduate course

The 23rd annual spring graduate course of the Gill Memorial Eye, Ear, and Throat Hospital, Roanoke, Virginia, will be held April 3 to 8, 1950. The course is open only to qualified practitioners who are giving full time to their specialty. The hospital reserves the right to reject any application.

On the guest faculty will be the following: Dr. F. W. Stocker, Durham, North Carolina; Dr. Conrad Berens, New York; Dr. Fred Wilson, Chicago; Dr. C. W. Mayo, Rochester, Minnesota; Dr. Edmund B. Spaeth, Philadelphia; Dr. Arthur J. Bedell, Albany, New York; Dr. James J. Regan, Boston; Dr. W. Gayle Crutchfield, Charlottesville, Virginia; Dr. Stuart Cullen, Iowa City, Iowa; Dr. Richard G. Scobee, St. Louis; Dr. Daniel S. Cunning, New York; Dr. Alson E. Braley, New York; Dr. Karl M. Houser, Philadelphia; Dr. Hugo L. Bair, Rochester, Minnesota; Dr. Gabriel Tucker, Philadelphia; Dr. Edward M. Walzl, Baltimore; Sir Alexander Fleming, London; Dr. J. Barrett Brown, St. Louis; Dr. Walter B. Hoover, Boston; Dr. Oscar O. Hansen-Pruss, Durham, North Carolina.

Histopathology course

The schedule of the three-month course in "Histopathology of the Eye," given by Dr. Brittain F. Payne and associates at the New York Eye and Ear Infirmary has been rearranged to last one week in January, 1950.

The course will be given in the afternoons of the second week in January, and will consist of the same number of hours of instruction and material as previously allotted. The dates are from January 9th to 14th, and further information may be obtained by writing the Post-Graduate Division of the New York University College of Medicine.

Wills Hospital conference

The annual clinical conference of the Wills Eye Hospital will be held in Philadelphia on Friday and Saturday, March 17 and 18, 1950.

Dr. Francis Heed Adler will deliver the annual Arthur J. Bedell Lecture on the evening of March 17th.

Mexican meeting

From November 6th to 12th, the Association to Eradicate Blindness in Mexico will have its fourth biannual meeting. Further information may be obtained by writing the secretary, Dr. Ramón Olivera López, Gomez Farias 19, Mexico, D.F.

Reservations for Florida meeting

The National Society for the Prevention of Blindness will hold a five-day conference in conjunction with the interim session of the Pan-American Association of Ophthalmology, March 26 to 30, 1950, at the Floridian Hotel, Miami Beach, Florida. The theme of the meeting will be "The Americas Unite to Save Sight," and among the subjects to be discussed are: Current blindness prevention programs in countries of the Western Hemisphere; Trachoma; Industrial ophthalmology; Eye problems of school children; Medical and social management of the glaucomas.

Persons directly or indirectly concerned with eye health and safety will find this conference of interest. Details concerning the program may be obtained by writing directly to the National Society for the Prevention of Blindness, 1790 Broadway, New York 19.

Reservations should be made in the near future with the Floridian Hotel, 540 West Avenue, Miami Beach, Florida.

Grants-in-Aid offered

The National Council to Combat Blindness, which was established for the purpose of financing and stimulating ophthalmological research, is now offering grants-in-aid to scientific investigators. Applications to be considered for the first group of awards should be in the office of the council by February 15, 1950. Application forms may be obtained by ad-

dressing: Secretary, National Council to Combat Blindness, Inc., 1186 Broadway, New York 1, New York.

Societies

Orthoptic technicians program

On October 10th and 11th, at Chicago, the American Association of Orthoptic Technicians held its eighth annual meeting. On the program were:

"Anomalous retinal correspondence: Its essence and its significance in diagnosis and treatment," Dr. Hermann M. Burian, Boston; "Orthoptics in relation to preoperative training," Mrs. Elsie Laughlin, Iowa City, Iowa; "Physiology of vision," Miss Ann Stromberg, Boston; "Standards for vision," Miss Ruth McNab, Detroit; "Treatment of amblyopia," Miss Martha Peterson, Columbus, Ohio; "Types of occlusion and results," Miss Ruth Fisher, Denver; "Differentiation of Phi phenomenon and parallax and use of Phi phenomenon in determination of retinal correspondence," Miss Dorothy Franklin, Beverly Hills, California (with a discussion by Dr. S. Rodman Irvine, Beverly Hills); "Orthoptics in relation to postoperative training," Miss Frances Fowler, Seattle; "Orthoptic suggestions," Miss Eva DeMars, Philadelphia; "Stimulus-response mechanisms in binocular coördination," Dr. Edwin F. Tait, Norristown, Pennsylvania (with a discussion by Miss Electra Healy, Chicago); "Anomalous correspondence," Miss Marjorie Enos, New York (with a discussion by Dr. Michel Loutfallah, Santa Barbara, California); "The accommodative effort syndrome," Dr. Robert Hill, Portland, Oregon (with a discussion by Mrs. Louise Wells Kramer, Washington, D.C.).

Penido Burnier officers

The Medical Association of the Institute Penido Burnier, Campinas, Brazil, has elected the following officers for 1949-1950; President, Dr. Penido Burnier Filho; 1st secretary, Dr. Alfonso Ferreira Filho; 2nd secretary, Dr. Alfredo Martinelli; historian and treasurer, Dr. Leôncio de Souza Queiroz; directors, Dr. Guedes de Melo Filho, Dr. F. J. Monteiro Sales, and Dr. José Martins Rocha.

Central Illinois Society

The next meeting of the Central Illinois Society of Ophthalmology and Otolaryngology will be held at the Abraham Lincoln Hotel in Springfield, Illinois, on November 18th, 19th, and 20th. Dr. William L. Benedict of the Mayo Clinic will give lectures on: "Cataracts and systemic diseases," "General diseases: Ocular manifestations," and "Tumors of the eye and orbit."

Dr. H. P. House, associate professor of otolaryngology at the University of Southern California, will speak on: "Indications and end results of fenestration surgery," "Management of otitis media," and "Management of the continually stuffy nose."

Dr. Walter E. Owen, Peoria, Illinois, a member of the society will speak on: "Drug therapy in respiratory allergy." Dr. Herbert M. Kobes, director of the University of Illinois, Division of Services for Crippled Children, will speak on the "State of Illinois coöperates with the ophthalmologist and otolaryngologist."

Hawaii Society program

The Hawaii Eye, Ear, Nose and Throat Society held its opening fall meeting at Tripler General Hospital, Honolulu, Territory of Hawaii, on September 15th.

A paper on "An evaluation of methods of treatment in 155 cases of pterygium" was presented by Lieut. Col. John H. King, Jr. (MC), chief of EENT section, Surgical Service, Tripler General Hospital. His talk was illustrated by descriptive slides on cases of pterygium and on various operations performed during the past 12 months. The presentation was discussed by Dr. Forrest J. Pinkerton, Dr. Ogden D. Pinkerton, Dr. H. F. Moffat, and Dr. Philip M. Corboy. Maj. Aubrey K. Brown (MC), assistant chief of EENT section, presented a case report on "Esophageal stenosis." His paper was discussed by Dr. John P. Frazer, Dr. L. Q. Pang, and Dr. Clarence J. Kusunoki.

Toronto refresher course

The Faculty of Medicine of the University of Toronto offers a combined refresher course in ophthalmology and otolaryngology from January 9 to January 14, 1950.

The otolaryngological subjects will be presented during the first three days of the course and the ophthalmological subjects during the last three days. Lectures and surgical clinics in both subjects will be given by outstanding guest speakers as well as by members of the Faculty.

Guest speakers in otolaryngology will be: Dr. W. J. McNally, Montreal, and Dr. Henry Orton, Newark, New Jersey; in ophthalmology: Dr. P. C. Kronfeld, Chicago, and Dr. J. A. MacMillan, Montreal.

The course will be given for a minimum of 10 students and a maximum of 20 students. The fee for all or any part of the course will be $100.00, payable to the chief accountant, Simcoe Hall, University of Toronto. Application should be made to the Dean of the Faculty of Medicine, not later than November 30, 1949.

Glasgow autumn term

During October a series of meetings are being held in the Department of Ophthalmology, University of Glasgow. On October 5th, Dr. George Leaf presented a paper on "Biochemical aspects of methanol poisoning," and on October 12th, Dr. W. O. G. Taylor spoke on "Control of clotting in ophthalmology." "Tobacco amblyopia," is the subject Dr. R. Leishman presents on October 19th. Dr. A. Wright Thomson will speak on "Cyrate atrophy of the choroid" on October 26th. At each meeting, discussion will follow the presentation of the main paper.

PRESCRIPTION OPTICIANS

POSTGRADUATE CONFERENCE IN NEUROMUSCULAR ANOMALIES OF THE EYES

The Children's Memorial Hospital, Chicago

By George P. Guibor

For Graduates in Medicine **February 5-10 inclusive**

Course Includes Theoretical and Practical Surgical and Non-Surgical Examinations and Treatments

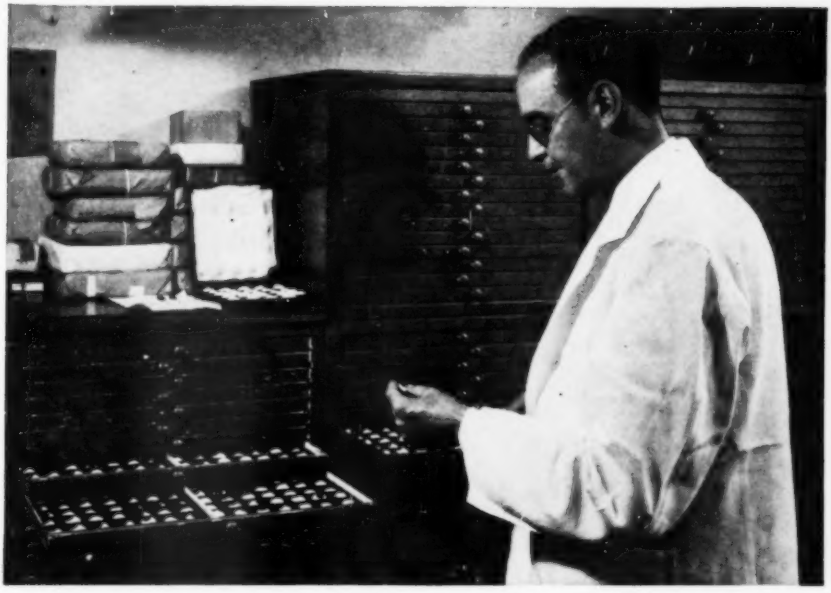
1. Anatomy
2. Physiology
3. Discussion of Patients with Squint
4. Examination of Patients by Students

No Registrations Accepted After January 20 **Fee $50.00**

For Further Details Apply to the Secretary of Course

The Children's Memorial Hospital, 707 Fullerton Avenue, Chicago 14

Complete ARTIFICIAL EYE *Service*



MAIL ORDER SELECTIONS OF EYES IN GLASS AND PLASTIC

WE CARRY THE LARGEST STOCK OF GLASS AND PLASTIC EYES IN THE UNITED STATES

Our 24 hour mail order services enables you to make temporary and final fittings in either glass or plastic eyes. Within 6 hours after receiving your order for a selection, we will send an assortment of either 12 or 24 artificial eyes.

Write for our "Color Chart and Size Guide"

NOW AVAILABLE

- **Cutler Implants (Ball & Ring and Scleral)**
- **Sphere Implants (Glass, Plastic and Gold)**
- **Radiation Therapy Eye Shields**
- **Plastic conformers and drains**
- **Intraocular Foreign Body Locators**
- **Eye Hooks and Suction Cups**

CHICAGO
DETROIT
CLEVELAND
KANSAS CITY
MINNEAPOLIS
NEW ORLEANS
ST. LOUIS

NEW YORK
BALTIMORE
BOSTON
BUFFALO
PHILADELPHIA
PITTSBURGH
WASHINGTON

MAGER & GOUGELMAN, INC.

30 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS

OPHTHALMIC INSTRUMENTATION AT ITS FINEST

True, AO is widely recognized as the most comprehensive source for ophthalmic instruments . . . But quality and continuing scientific advancement are the prime objectives. For it is by constantly improving the facility, the scope, and the precision of its instrumentation that AO maintains its leadership in the field.

American Optical
COMPANY